California High-Speed Rail Authority

RFP No.: HSR 13-57

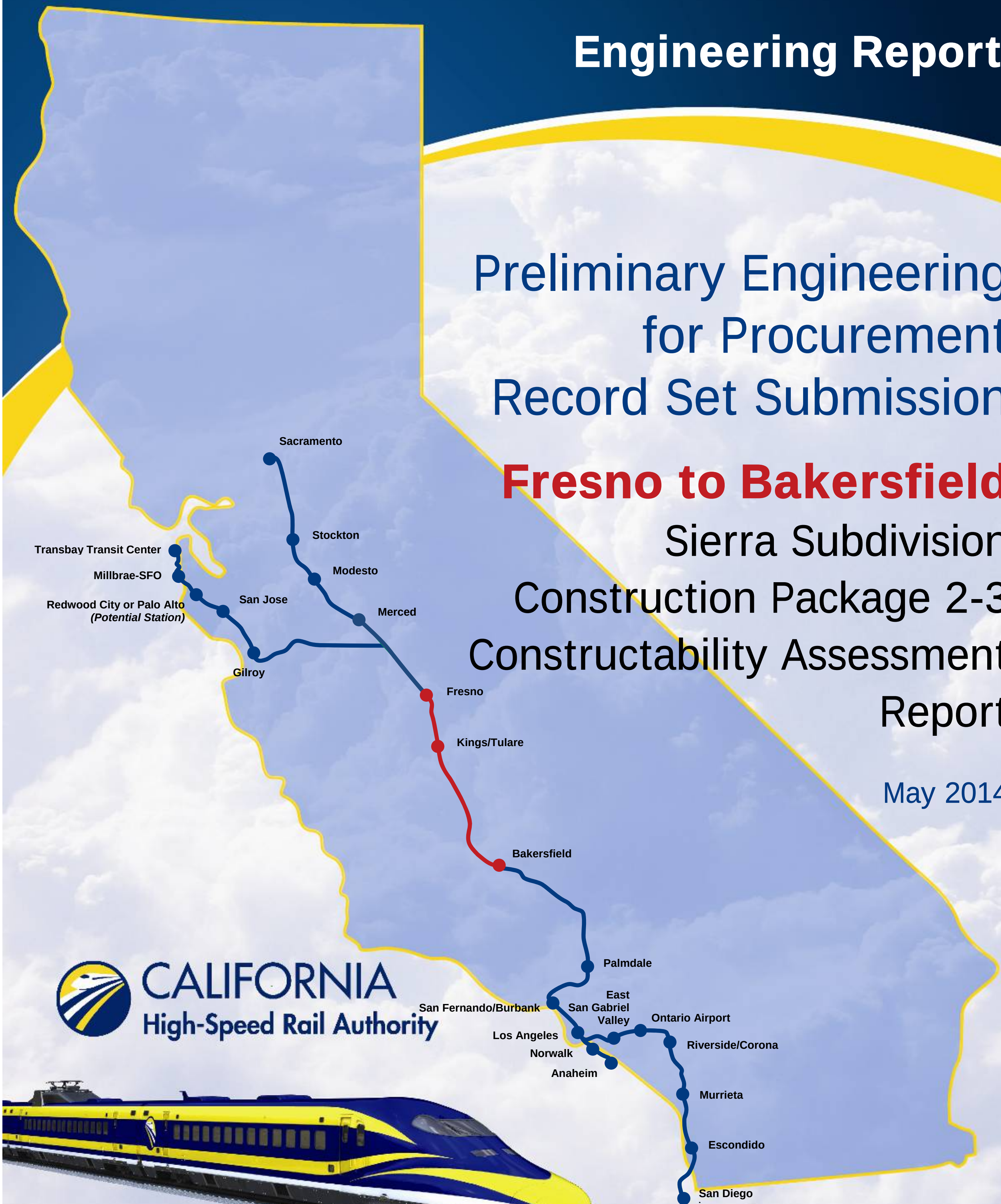
Request for Proposals for Design-Build Services for Construction Package 2-3

Reference Material, Part C.9
PE4P Constructability Assessment Report

RFP No.: 13-57 – Addendum No. 2 - 06/30/2014

CALIFORNIA HIGH-SPEED TRAIN

Engineering Report



Preliminary Engineering for Procurement Record Set Submission

Fresno to Bakersfield

Sierra Subdivision Construction Package 2-3 Constructability Assessment Report

May 2014

RFP No.: 13-57 – Addendum No. 2 - 06/30/2014

CALIFORNIA
High-Speed Rail Authority

Preliminary Engineering for Procurement
Record Set Submission
Fresno to Bakersfield
Sierra Subdivision
Construction Package 2-3
Constructability Assessment Report

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Prepared by:

URS/HMM/Arup Joint Venture

May 2014

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List of Abbreviations

Authority	California High-Speed Rail Authority
BMP	best management practices
Caltrans	California Department of Transportation
CAM	Constructability Assessment Memo
CASQA	California Stormwater Quality Association
CDWR	California Department of Water Resources
CEQA	California Environmental Quality Act
CL	Construction Laydown Area
CP	construction package
CS	Construction Staging Area
FEIR	Final Environmental Impact Report
FEIS	Final Environmental Impact Statement
FB	Fresno to Bakersfield
GI	ground investigation
GIS	geographic information system
HMF	Heavy Maintenance Facility
HSR	high-speed rail
KTR	Kings Tulare Region
MOIF	maintenance of infrastructure facilities
MOWF	Maintenance of Way Facility
NEPA	National Environmental Policy Act
NOD	Notice of Determination
PC	prestressed concrete
PE4P	Preliminary Engineering for Procurement
PPMRP	Pollution Prevention and Monitoring and Reporting Plan
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SCL	Skewed Crossing Laydown Area
SJVAPCD	San Joaquin Valley Air Pollution Control District
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TDC	targeted design constituent
UPRR	Union Pacific Railroad

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Executive Summary

Executive Summary

The Fresno to Bakersfield Section of the California High-Speed Train Project is currently divided into four construction packages (CPs) for design-build procurement purposes. The first construction package (CP1) involves high-speed rail (HSR)-related works throughout the city of Fresno and is undergoing final design in preparation for construction. This Constructability Assessment Report is specifically focused on CP2-3 and identifies possible locations for Construction Staging Areas, Precasting Yards, and Construction Laydown Areas.

Five possible Construction Staging Areas are discussed in this memo, including two alternates at two of the five locations.

The Precast Operations Yards should be near extended lengths of precast viaduct to minimize distances between the Precast Operations Yards and the locations of erection. A Precasting Facility can be set up in any of the Construction Staging Areas identified in this report, but it is assumed that the preferred location will be at the Kings/Tulare Station on the H alignment due to the extended length of viaduct required for an elevated station at this location.

The Construction Laydown Areas are required for a shorter period than the Construction Staging Areas and are required to construct the complex structures over waterways, existing highways, and railroads. The 6 Construction Laydown Areas identified in this report will be used to construct the steel truss structures over Cole Slough, Dutch John Cut, Kings River, and Riverside Ditch on the H Alignment; over SR 43 in two locations (one on the H Alignment and one on the K4 Alignment); and one over Cross Creek on the K4 Alignment.

There are also two temporary Skewed Crossing Laydown Areas identified in this report, which are required to construct the HSR elevated crossover structure over the BNSF. Similar to the temporary Construction Laydown Areas for steel truss erection, these sites would need to be acquired on a temporary basis, until the construction of the elevated crossover structure over the BNSF is complete.

This report also identifies issues such as noise, pollution, and traffic disruption, as well as provides commentary on assumed construction sequence and durations of main activities, general construction methods, third-party coordination, potential excavation hazards, groundwater management, right-of-way acquisition, and design and construction permits.

The major critical path construction activity for CP2-3 is anticipated to be the total 7.24 miles of standard viaduct construction. This activity is expected to take 27 months, starting 6 months after the commencement of the contractor mobilization, which includes setting up the necessary staging areas and precasting facilities. The reason for the assumed 6-month lag is to account for the time required for concrete testing before full-scale concrete production operations can commence. A period of 3 months is assumed to demobilize and close out the project. This is a total of 36 months and assumes that the contractor is not delayed by enabling works outside of their control such as third-party utility relocations and BNSF railroad relocations. An alternate construction schedule for this viaduct reach has been provided, which takes a total of 50 months as a result of reducing the number of assumed working locations from six to four. This highlights the impact that resources and location constraints can have on a construction schedule.

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Section 1.0

Introduction

1.0 Introduction

1.1 Purpose

The purpose of this report is to identify possible locations for Construction Staging Areas, Precasting Yards, and Construction Laydown Areas and provide constructability input specific to CP2-3 design. This report also identifies issues such as noise, pollution, and traffic disruption, as well as provides commentary on assumed construction sequence and durations of main activities, general construction methods, third-party coordination, potential excavation hazards, groundwater management, right-of-way acquisition, and design and construction permits.

1.2 Project Overview

In 1996, the state of California established the California High-Speed Rail Authority (Authority). The Authority is responsible for studying alternatives to construct a high speed rail system that will provide intercity high-speed rail (HSR) service on over 800 miles of track throughout California. This rail system will connect the major population centers of Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego. The Authority is coordinating the project with the Federal Railroad Administration. The California HSR Project is envisioned as a state-of-the-art, electrically powered, high-speed, steel-wheel-on-steel-rail technology that will include state-of-the-art safety, signaling, and automated train-control systems.

The statewide HSR has been divided into a number of sections for the planning, environmental review, coordination, and implementation of the project. This *Constructability Assessment Report* (CAR) is focused on the section of the HSR between Fresno and Bakersfield, specifically the Construction Package (CP) 2-3 subsection of the alignment extending from E American Avenue south of the Fresno metropolitan area to 1 mile north of the border between Tulare County with Kern County. The limits of CP 2-3 are shown schematically in **Figure 1.3-1.** All of the Construction Package limits are shown in Table 1.3-2.

1.3 Project Description

1.3.1 Fresno to Bakersfield High-Speed Rail Section

The proposed Fresno to Bakersfield (FB) Section of the HSR is approximately 114 miles long and traverses a variety of land uses, including farmland, large cities, and small cities. The FB Section includes viaducts and segments where the HSR will be at-grade or on embankment. The route of the FB Section passes by or through the rural communities of Bowles, Laton, Conejo, Armona, and Allensworth and the cities of Fresno, Hanford, Selma, Corcoran, Wasco, Shafter, McFarland, and Bakersfield.

The FB Section extends from north of Stanislaus Street in Fresno to the northern most limit of the Bakersfield to Palmdale Section of the HSR at Oswell Street in Bakersfield.

1.3.2 Alignments

The FB HSR Section is a critical link connecting the northern HSR sections of Merced to Fresno and the Bay Area to the southern HSR sections of Bakersfield to Palmdale and Palmdale to Los Angeles. The FB Section includes HSR stations in the cities of Fresno and Bakersfield, with a third station in the vicinity of Hanford. The Fresno and Bakersfield stations are this section's project termini.

The FB Section of the HSR is divided into 10 subsections. **Table 1.3-1** and **Figure 1.3-1** illustrates the subsections and their corresponding alignment prefix.

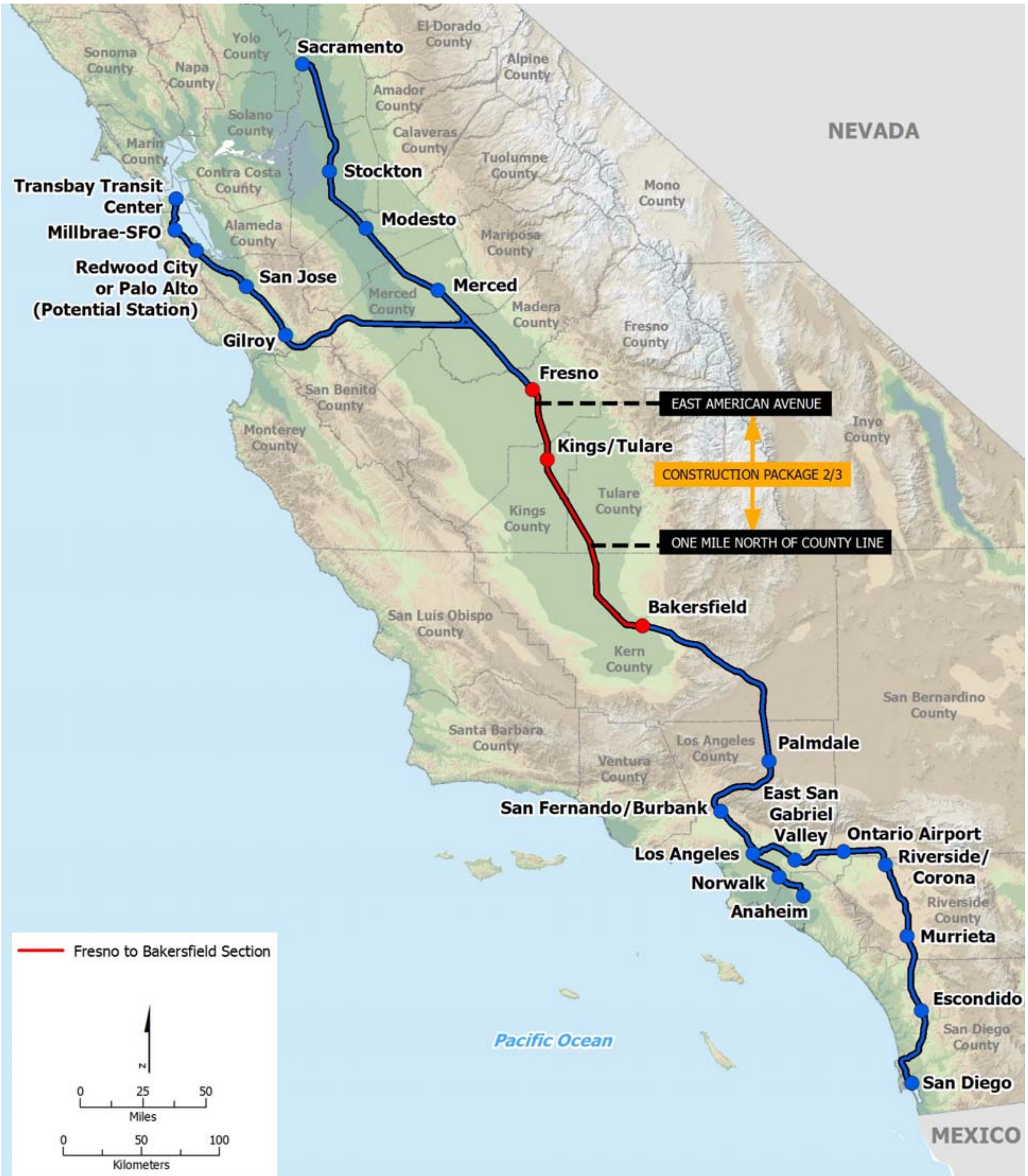

Figure 1.3-1
HSR Corridor – Fresno to Bakersfield – Construction Package 2-3

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The preliminary engineering for procurement (PE4P) design will be based on the following preferred alignments:

- F1, M, H, K4, C2, P, A1, L1, WS1, and B3.

Table 1.3-1
FB Preferred Alignment Subsections

Alignment Prefix	Alignment Subsection Name	Location		County	EIR/EIS Name*
		Begin	End		
F1	Fresno	San Joaquin St (North of Stanislaus Street)	E Lincoln Ave	Fresno	BNSF
M	Monmouth	E Lincoln Ave	E Kamm Ave	Fresno	BNSF
H	Hanford	E Kamm Ave	Iona Ave	Fresno and Kings	BNSF (Hanford East)
K4	Kaweah	Idaho Ave	Nevada Ave	Kings	BNSF (Hanford East) (connects to C1 [Corcoran Elevated] or C2 [Corcoran Bypass])
C2	Corcoran Bypass	Nevada Ave	Ave 128	Kings and Tulare	Corcoran Bypass
P	Pixley	Ave 128	Ave 84	Tulare	BNSF
A1	Allensworth Bypass	Ave 84	Elmo Hwy	Tulare & Kern	Allensworth Bypass
L1	Poso Creek	Elmo Hwy	Whisler Rd	Kern	Allensworth Bypass (connects to BNSF [through Wasco-Shafter])
WS1	Through Wasco-Shafter	Whisler Rd	Hageman Rd	Kern	BNSF (through Wasco-Shafter)
B3	Bakersfield Urban	Hageman Rd	Baker St	Kern	Bakersfield Hybrid
*Environmental Impact Report/Statement					

CP1 B-C is 3.1 miles long and runs from north of Stanislaus Street in Fresno to East American Avenue. CP2-3 is 65.7 miles long and runs from E American Avenue (1 mile south of Fresno) to 1 mile north the Kern County line. CP4 is approximately 28.8 miles long and runs from the end of CP2-3 to 7th Standard Road, which is approximately 7 miles north of Bakersfield.

Table 1.3-2
CP Limits

Construction Package	Limits		Stationing		Miles
	Start	End	Start	End	
CP1 B-C	North of Stanislaus Street	E American Avenue	S 10806+00	S 10970+00	3.1
CP2-3	E American Avenue	1 mile north of the Kern/Tulare county line	587+30.67	4446+50	65.7
CP4	1 mile north of the Kern/Tulare county line	7th Standard Road	4446+50	6293+00	28.8

1.3.3 Overview of Construction Staging and Precasting Facilities

This report describes the requirements for temporary construction facilities for the HSR specific to CP2-3. Two main types of facilities are required: Large Construction Staging and Precasting Areas and smaller temporary Construction Laydown Areas and Skewed Crossing Laydown Areas.

The Construction Staging Areas will house incoming materials; provide areas for material preparation, storage of equipment, maintenance of equipment, operations preparation, and construction offices; and allow good housekeeping throughout the alignment. Haphazard staging of materials and equipment throughout the alignment would not be conducive to the construction process and is not normal practice. Preliminary locations for Construction Staging Areas are placed at regular intervals along the HSR route. The locations are meant to be low maintenance and out of the general public’s way. Each site will regularly and frequently receive materials and equipment; therefore, proximity to main roads and direct access to construction side roads and arterial roads are important for reducing the impact on the general flow of traffic. Five possible Construction Staging Areas are discussed in this memo, including two alternates at two locations.

The Precast Operations Yards should be near extended lengths of precast viaduct to minimize distances between the Precast Operations Yards and the locations of erection. Rural locations are desirable for precast sites; these facilities will create visual and noise impacts. A Precasting Facility can be set up in any of the Construction Staging Areas identified in this report but it is assumed that the preferred location will be at the Kings Tulare Station on the H alignment due to the extended length of viaduct required for an elevated station in this location.

The Construction Laydown Areas are required for a shorter period than the Construction Staging Areas and are required to construct the complex structures over waterways, existing highways, and railroads. There are a total of 6 Construction Laydown Areas identified in this report.

The six Construction Laydown Areas discussed in this report will be used to construct the steel truss structures over Cole Slough, Dutch John Cut, Kings River and Riverside Ditch on the H Alignment; over SR 43 in two locations (one on the H Alignment and one on the K4 Alignment) and one over Cross Creek on the K4 Alignment.

There are also two temporary Skewed Crossing Laydown Areas identified in this report which are required to construct the HSR elevated slab over the BNSF. Similar to the temporary Construction Laydown Areas for steel truss erection, these sites would need to be acquired on a temporary basis, until the construction of the elevated slabs over the BNSF is complete.

This report describes the process by which the staging, precasting, and laydown areas were chosen and expands on the reasons each site was selected. The proposed areas in this report are preliminary and contingent on further detailed investigations for suitability. These sites will ultimately be the responsibility of the Contractor to acquire.

Table 1.3-3 lists the proposed sites and their access points.

Table 1.3-3
Proposed Staging and Precasting Areas

#	Location	Type	Name	Size (acres)	Construction Access Points
1	Fresno (Proposed HMF and MOI)	CS	CS1	117	South on S Cedar Ave and east onto Jefferson Ave
2	North of Laton	CS	CS2	90	SR 41 and Central Valley Hwy/SR 43 with access via E Clarkson Ave
3	Hanford east of Central Valley Hwy/SR 43 & Alternative 1 (Kings Tulare Regional Station)	CS	CS3-A & CS3-B	86 & 81	North or south on Central Valley Hwy/SR 43
4	South of Hanford	CS	CS4	124	North or south on Central Valley Hwy/SR 43 and east on unidentified road
5	5 miles southeast of Corcoran	CS	CS5-A & CS5-B	168 & 164	North or south on Central Valley Hwy/SR 43 with access via Ave 136 and on Road 32 for CS6-A and Ave 128 for CS6-B
CS: Construction Staging Area					

Table 1.3-4
Proposed Laydown Areas

#	Location	Type	Name	Size (acres)	Construction Access Points
1	North of Hanford	CL	CL1, CL2 & CL3	16, 10 & 33	Along Central Valley Hwy/SR 43
2	North of Hanford	CL	CL4	14	North on Central Valley Hwy/SR 43 and east on unidentified road
3	South of Hanford	CL	CL5	5	Along Central Valley Hwy/SR 43
4	Corcoran	CL	CL6	33	North or south on Central Valley Hwy/SR 43
CL: Construction Laydown Area					

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Table 1.3-5 lists the proposed Skewed Crossing Laydown Areas and their access points.

Table 1.3-5
Proposed Skewed Crossing Laydown Areas

#	Location	Type	Name	Size (acres)	Construction Access Points
1	4½ miles north of Laton	SCL	SCL1	12	Central Valley Hwy/SR 43 to E Conejo Ave
2	4 miles southeast of the city of Corcoran	SCL	SCL2	31	Central Valley Hwy/SR 43 to Avenue 144
SCL: Skewed Crossing Laydown Area					

Appendix A shows the locations of the proposed Construction Staging, Precasting, and Laydown Areas.

Section 2.0

Segment Construction Packaging

2.0 Segment Construction Packaging

The PE4P for the Fresno to Bakersfield segment of the HSR has been divided into three main CPs from Fresno to 7th Standard Road which is seven miles north of Bakersfield. A future construction package is required from 7th Standard Road to south of the Bakersfield station terminating at Oswell Street. The focus of this report is Construction Package 2-3 (CP2-3).

2.1 Construction Package 2-3

CP2-3 encompasses the following preferred alignment:

- F1 part - 0.75 mile (FB 15% F1 alignment is a total of 7 miles).
- M – 8.24 miles.
- H – 20.45 miles.
- K4 – 9.92 miles.
- C2 – 9.49 miles.
- P – 6.88 miles.
- A1 part - 9.98 miles (FB 15% A1 alignment is a total of 19.03 miles).
- **Total – 65.70 miles.**

CP2-3 extends from E American Avenue, just outside the southern boundary of the city of Fresno, to a point on the proposed alignment 1 mile to the north of the Tulare County/Kern County line, representing 65.7 miles out of the 114-mile total length of the FB section. The alignment of CP2-3 is mainly at grade but includes elevated portions where the HSR is on viaduct crossing the BNSF Railway and the San Joaquin Valley Railroad (SJVRR) and crossings of the Kings River and Cross Creek, inclusive of their designated floodplains. The alignment bypasses the City of Corcoran on the east and the community of Allensworth on the west. This subsection also includes the site of the KTR Station, which coincides with the elevated crossing of the SJVRR, and where the viaduct widens from two HSR tracks to four tracks to cater for the future station platforms. To accommodate the HSR right-of-way where the two railroads run parallel to each other, it will be necessary to relocate approximately 5.5 miles of the BNSF railroad mainline tracks, along with approximately 4.8 miles of loading/unloading sidings serving their customers.

Table 2.1-1
CP2-3 Limits

Construction Package	Start	Finish	Approx. Length (miles)	Key Alignment Reference
CP2-3	E American Avenue	1 mile north of the Tulare County/ Kern County line	65.7	F1 M H K4 C2 P A1

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Section 3.0

Construction Staging and Precasting Areas

3.0 Construction Staging and Precasting Areas

The Construction Staging Areas will house incoming materials; provide areas for material preparation, storage of equipment, maintenance of equipment, operations preparation, and construction offices; and allow good housekeeping throughout the alignment. Haphazard staging of materials and equipment throughout the alignment would not be conducive to the construction process and is not normal practice. Preliminary locations for Construction Staging Areas are placed at regular intervals along the HSR route. The locations are meant to be low maintenance and out of the general public's way. Each site will regularly and frequently receive materials and equipment; therefore, proximity to main roads and direct access to construction side roads and arterial roads are important for reducing the impact on the general flow of traffic. Five possible Construction Staging Areas are discussed in this memo, including two alternates at two locations.

The Precast Operations Yards should be near extended lengths of precast viaduct to minimize distances between the Precast Operations Yards and the locations of erection. Rural locations are desirable for precast sites; these facilities will create visual and noise impacts. A Precasting Facility can be set up in any of the Construction Staging Areas identified in this report but it is assumed that the preferred location will be at the Kings Tulare Station on the H alignment due to the extended length of viaduct required for an elevated station in this location.

There are various means and methods associated with viaduct construction which are discussed in section 7.6. As the overall length of continuous standard span viaduct in CP2-3 is relatively short, it may be more economical to use other means of construction such and conventional Cast in Place (CIP) which is widely used in California or Moving Scaffolding System (MSS) alleviating the need for establishing a precasting facility. However, the establishment of a dedicated concrete batching plant will more than likely be required and the Kings Tulare Station site is ideal for this.

3.1 Construction Staging Areas Criteria

The following four criteria are the guidelines for the selection of Construction Staging Areas and Precasting Facilities.

3.1.1 Traffic

Selected areas are to have direct access to arterials from major highways. Direct access to the HSR right-of-way affords direct transport of materials and equipment to construction sites with minimal impacts on traffic. Sites should also be selected to minimize interference with pedestrians, bicyclists, and transit as possible.

Precast Operations Yards should be located within the same footprint as Construction Staging Areas to minimize cost and potential environmental impacts.

The load and volume capacity of existing structures and roads would need to support construction operations. An analysis of these existing roads and structures would be undertaken by the contractor prior to final site selection. Similarly, a site-specific investigation of horizontal and vertical clearances and of existing geometric road conditions, as they pertain to construction equipment mobility and transport, would need to be undertaken by the contractor.

3.1.2 Area

A minimum of 80 acres is desired for construction staging operations. In addition to this 80-acre minimum area, a Precasting Facility requires a minimum of 17 acres. The size of the staging areas depends on the areas available in each location. Sites must meet the minimum area requirements because the amount of available space affects the production schedule, especially for the precast structural sections.

3.1.3 Location

Construction Staging Areas should be evenly distributed along the alignment to minimize the distances between construction sites. The staging areas should be spaced 15 to 25 miles apart. Locations within the HSR right-of-way would minimize land acquisitions. Floodplains and environmentally sensitive areas should be avoided. Being in a floodplain is a risk to the contractor. All sites will be outside of UPRR and BNSF facilities' rights-of-way and will observe a minimum of 25 feet offset from their tracks/operations.

To minimize the distances that the large precast sections are transported, proposed Precast Operations Yards should be close to where the precast sections will be erected. The site selection of precasting Facilities will greatly affect the production efficiency of the large precast members — particularly consideration of the length of time to fabricate and the time and cost to transport and erect precast members. To reduce the contractor's cost and risk, precast operations should not be in areas that are sensitive to noise or that could restrict working hours.

3.1.4 Accessibility

The locations should be close to major roadways and to on- and off-ramps. Access to major roadways would aid in shipping to and receiving from the construction site and would minimize travel on side roads.

The benefits of access to existing utilities are reduced construction-site development time and reduced costs. Minimizing impacts on average daily traffic is a main consideration in the selection of suitable sites. Where traffic impacts are foreseen, the contractor should put in place a location-specific, activity-based trip schedule to minimize those impacts. Accessibility to these sites is a key factor for efficient rates of production.

3.2 Proposed Precast Operation Layout Schematic

As stated in Section 3.1.2, a minimum of 17 acres is required for the Precast Operations Yards. **Table 3.2-1** outlines how these 17 acres are composed. **Figure 3.2-1** graphically shows the proportions into which the area would be divided.

Table 3.2-1
Composition of Precast Operations Yards

Facility Type	Area
Batch Plant	70,000 sq ft
Ancillary Space	70,000 sq ft
Rebar Storage & Bending Area	43,000 sq ft
Power Station	11,000 sq ft
Equipment Yard	22,000 sq ft
Material Storage Yard	300,000 sq ft
Molding Area	50,000 sq ft
Rebar Jig Area	65,000 sq ft
Material Testing & Office Area	65,000 sq ft
Access Roads	65,000 sq ft
Total	739,000 sq ft Or 17 acres

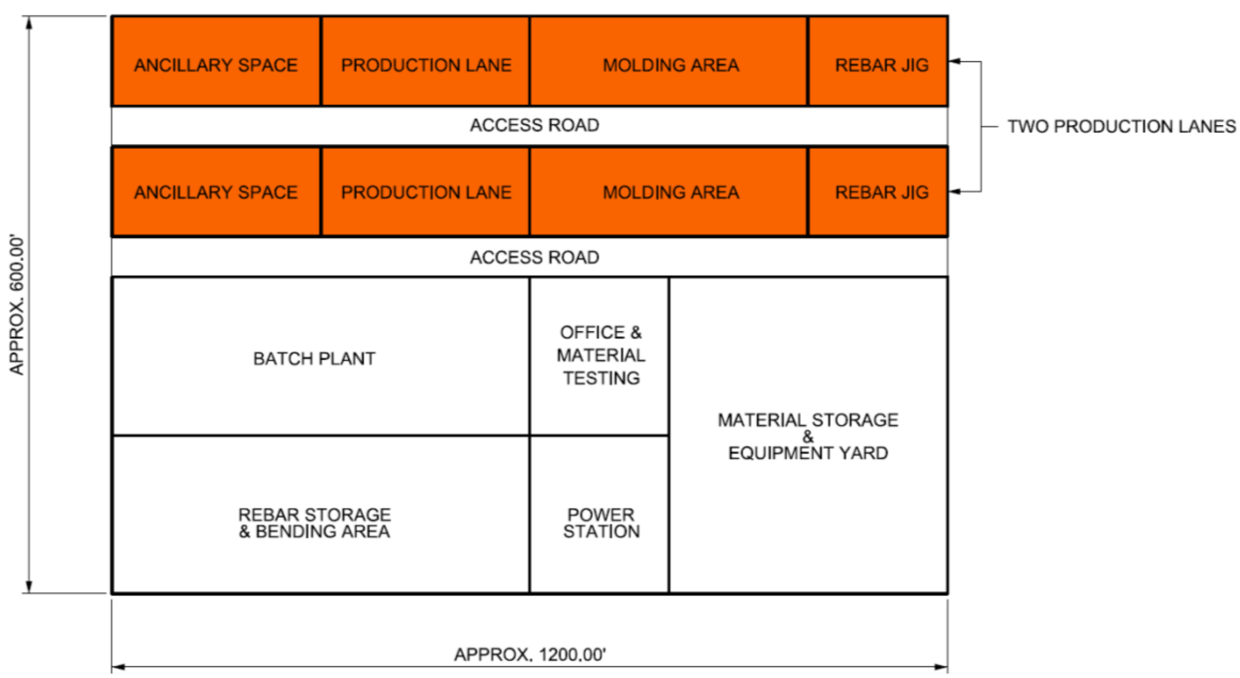

Figure 3.2-1
Proportions of Typical Precast Operations Yards

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3.3 Construction Staging Area 1

3.3.1 General Location

Site CS1 is south of the city of Fresno and is within a proposed HMF and MOI area. The site is bounded by the limits of CP2-3 to the north, by S Cedar Avenue to the west, by the BNSF to the east, and by E Lincoln Avenue to the south (see **Figure 3.3-1**).

3.3.2 Description of Site

The land is mainly used for agricultural purposes. There are approximately 4 buildings on this site. As this area is within a proposed HMF and MOI site, the overall project footprint is reduced, resulting in cost savings and reduced environmental impacts by using this proposed HMF site. If the HMF or MOI sites are not selected then there would be no cost savings.

3.3.3 Criteria Met

The traffic volume in this area is assumed to be low. There are no floodplains or identified environmentally sensitive areas at this location. The total area of this site is 117 acres, and it is located along the proposed HSR alignment. The proposed access to CS1 would be via S Cedar Avenue from SR 99 north- and southbound. For northbound access, take exit 127 to S Chestnut Avenue, left on E Central Avenue and right on S Cedar Avenue. There are no proposed road closures. Local roads would need to be repaired or refinished upon completion of construction in this location because the wearing to the existing roadway elements would be excessive.

CS1 is in a rural location on the outskirts of the city of Fresno and has a flat topography; there are no foreseen restrictions on equipment use by horizontal clearances or by existing geometric road conditions. Construction equipment requiring assembly in the staging area would be restricted by the vertical clearance of overhead power lines.

3.3.4 General Size, Shape, and Location

The 117-acre site is rectangular and is in an ideal location for staging materials and equipment. The space is adequate to house construction equipment and materials.

3.3.5 Site Summary

This site is adequate in size and location for both precasting operations and for staging construction materials and equipment. As there are no extended lengths of viaduct nearby specific to CP2-3, this may not be the best location for a precasting facility. The most likely area for a precasting facility will be at CS3-A and/or CS3-B which is discussed in sections 3.5 and 3.6 below. The proposed site is adjacent to the HSR right-of-way and would provide access to service roads and to the HSR construction areas.

Figure 3.3-1
Site CS1

3.4 Construction Staging Area 2

3.4.1 General Location

Site CS2 is north of Laton. The site is bounded by E Clarkson Avenue to the north, S Peach Avenue to the west, and S Minnewawa Avenue to the east (see **Figure 3.4-1**). The site consists of four parcels of agricultural land.

3.4.2 Description of Site

This land is in a rural location, and development is limited to two dwellings. Impacts to the area would be a loss of agricultural land on a temporary basis and possible relocation of the current occupants of two dwellings. The BNSF railroad is directly west of this site and would allow potential use of the railroad for material transportation but would also require additional site planning to ensure an efficient layout.

3.4.3 Criteria Met

The traffic in this area is made up of mostly agricultural equipment. There are no floodplains or identified environmentally sensitive areas in this location. The total area of this site is 90 acres, and it is located along the proposed HSR alignment. Site CS2 is close to SR 41 and to Central Valley Hwy/SR 43; each is 4 to 5 miles away. The proposed access to site CS2 would be via E Clarkson Avenue, and there are no proposed road closures. Local roads would need to be repaired or refinished upon completion of construction in this location because the wearing to the existing roadway elements would be excessive.

CS2 is in a rural location and has a flat topography; there are no foreseen restrictions on equipment use by horizontal clearances or by existing geometric road conditions. Construction equipment requiring assembly in the staging area would be restricted by the vertical clearance of power lines.

3.4.4 General Size, Shape, and Location

The 90-acre site is an irregular shape and in an ideal location for staging materials and equipment. There is adequate space to house construction equipment and materials for potential 30 to 50 miles of construction.

3.4.5 Site Summary

This site is adequate in size and location for staging construction materials and equipment. The proposed site is adjacent to the HSR right-of-way and would provide access to service roads and construction areas. No businesses would be relocated and existing structures could be used for site offices.

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Figure 3.4-1
Site CS2

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3.5 Construction Staging Area 3-A

3.5.1 General Location

Site CS3-A is on the eastern border of Hanford and directly south of the proposed Kings Tulare Region (KTR) station location on Alignment H. The site is bounded by Central Valley Hwy/SR 43 to the west, by E Lacey Boulevard to the south, by the cross-valley railroad to the north, and by Ponderosa Road to the east. An operating BNSF rail yard is directly west of the site.

3.5.2 Description of Site

This site consists of two parcels of agricultural land with one industrial structure. Impacts to the area would be the loss of agricultural land on a temporary basis and the possible relocation of one business. The BNSF railroad could possibly be used for the transportation of materials and equipment to the staging area.

3.5.3 Criteria Met

Site CS3-A is in a rural agricultural area, and should have minimal interference with pedestrians, bicyclists, and transit. The site is immediately west of the HSR right-of-way and therefore would allow access to the construction site and to construction roads. SR 198 and Central Valley Hwy/SR 43 are each less than a mile away, and these highways would provide favorable access for the delivery of materials and equipment to and from the staging site. The proposed site access would be via Central Valley Hwy/SR 43, and there are no proposed road closures. Local roads would need to be repaired or refinished upon completion of construction in this location because the wearing to the existing roadway elements would be excessive. The site is approximately 86 acres. The site does not encroach on any floodplains or environmentally sensitive areas.

CS3-A is in a rural location and has a flat topography; there are no foreseen restrictions on equipment use by horizontal clearances or by existing geometric road conditions. Construction equipment requiring assembly in the staging area would be restricted by the vertical clearance of power lines.

3.5.4 General Size, Shape, and Location

The 86-acre site is an irregular shape and is ideally located for use as a staging area for construction materials and equipment.

3.5.5 Site Summary

Site CS3-A is adequate in size and is located near future construction areas. The site is adjacent to the HSR right-of-way, the proposed KTR station and would provide access to service roads and to construction areas.

3.6 Construction Staging Area 3-B

3.6.1 General Location

Site CS3-B is directly north of CS3-A on the opposite side of the cross-valley railroad. An operating BNSF rail yard is directly west of the site (see **Figure 3.6-1**).

3.6.2 Description of Site

This site consists of three parcels of agricultural land with a total of 81 acres. The proposed KTR station is within this area. The only impact to the area would be the loss of agricultural land. The BNSF railroad might be used for the transportation of materials and equipment to the staging area.

3.6.3 Criteria Met

Site CS3-B is in a rural agricultural area, and should have minimal interference with pedestrians, bicyclists, and transit. The HSR right-of-way intersects the site and therefore would allow access to the construction site and to construction roads. SR 198 and Central Valley Hwy/SR 43 are each less than a mile away, providing favorable access for the delivery of materials and equipment to and from the staging site. The proposed site access would be via Central Valley Hwy/SR 43, and there are no proposed road closures. The site is approximately 81 acres. The site does not encroach on any floodplains or environmentally sensitive areas.

3.6.4 General Size, Shape, and Location

The 81-acre site is triangular and is ideally located for use as a staging area for construction materials and equipment.

3.6.5 Site Summary

Site CS3-B is adequate in size and is near future construction areas. The site is adjacent to the HSR right-of-way and would provide access to service roads and to construction areas. One benefit of selecting this location over CS3-A is the reduction to the overall project footprint by using the proposed KTR station location for construction staging in advance of constructing the station.

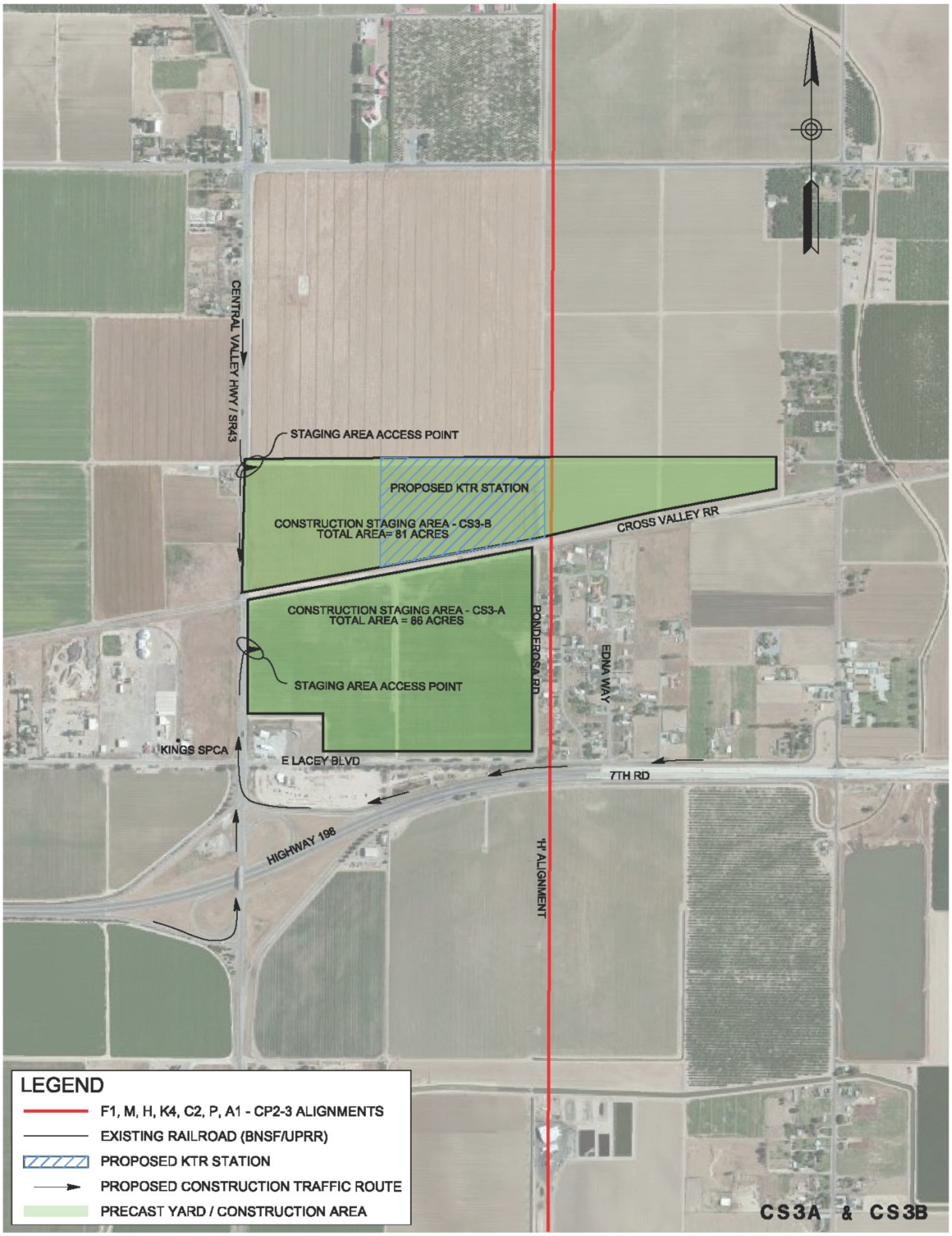

Figure 3.6-1
Sites CS3-A and CS3-B

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3.7 Construction Staging Area 4

3.7.1 General Location

Site CS4 is approximately 3 miles southeast of Hanford. The site is bounded by Central Valley Hwy/SR 43 to the west, by Iona Avenue to the south, by Houston Avenue to the north, and by a ditch to the east (see **Figure 3.7-1**). The CS4 site is within a proposed HMF footprint and consists of two parcels of agricultural.

3.7.2 Description of Site

This site consists of two parcels of agricultural land with a total of 124 acres. The only impact to the area would be the loss of agricultural land on a temporary basis. This site is easily accessible because of its proximity to Central Valley Hwy/SR 43.

3.7.3 Criteria Met

Site CS4 is in a rural agricultural area, and should have minimal interference with pedestrians, bicyclists, and transit. The HSR right-of-way intersects the site and therefore would allow access to the construction site and to construction roads. Central Valley Hwy/SR 43 runs almost parallel and SR 198 is approximately 2 miles away, providing favorable access for the delivery of materials and equipment to and from the staging site. The proposed site access would be via Central Valley Hwy/SR 43, and there are no proposed road closures. Local roads would need to be repaired or refinished upon completion of construction in this location because the wearing to the existing roadway elements would be excessive. The site is approximately 124 acres. The site does not encroach on any floodplains or environmentally sensitive areas.

3.7.4 General Size, Shape, and Location

The 124-acre site is rectangular and is ideally located for use as a staging area for construction materials and equipment.

3.7.5 Site Summary

Site CS4 is adequate in size and is located near future construction areas. The site is adjacent to the HSR right-of-way, it is in a proposed HMF site, and it would provide access to service roads and construction areas.

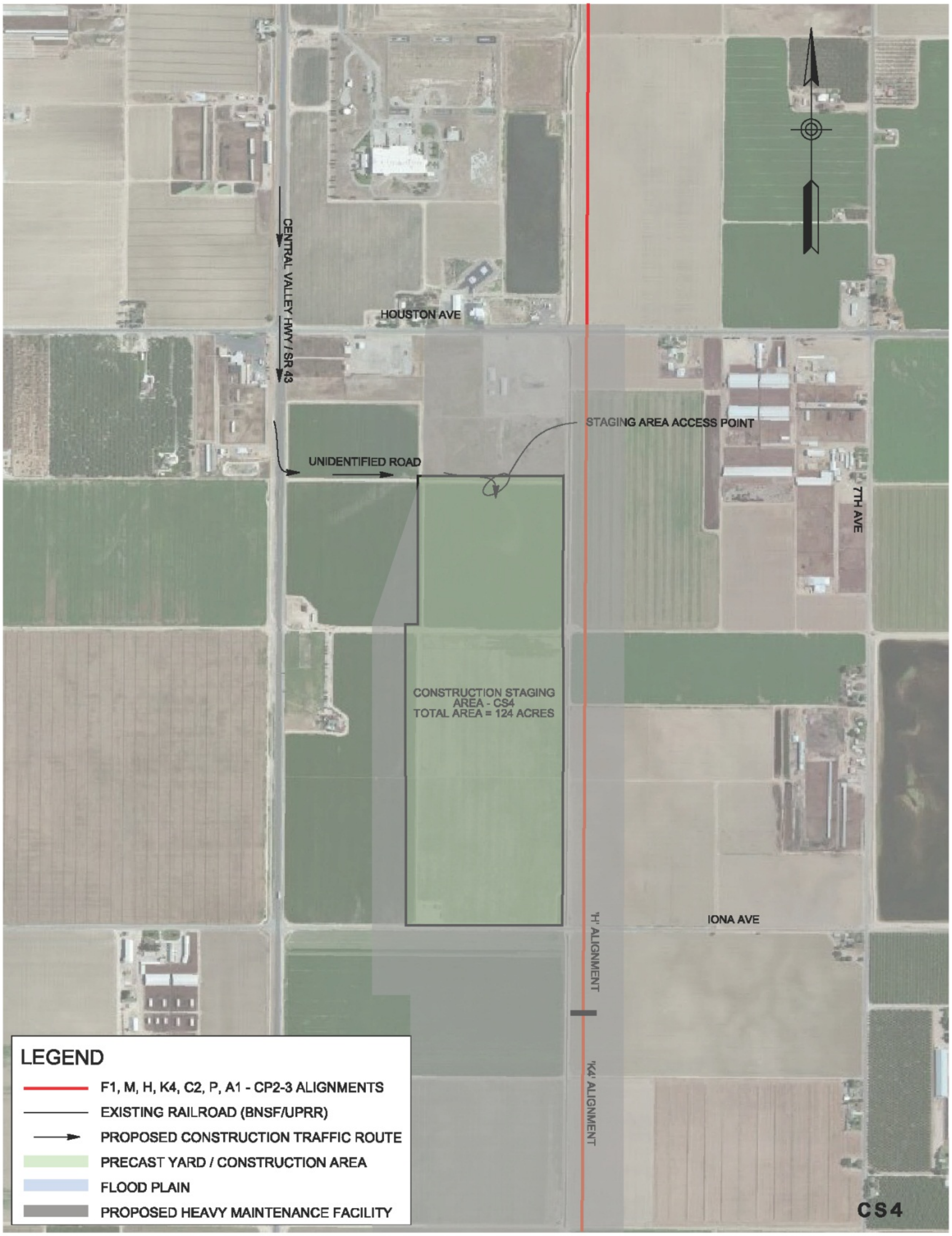

Figure 3.7-1
Site CS4

3.8 Construction Staging Area 5-A

3.8.1 General Location

Site CS5-A is 5 miles southeast of Corcoran and is directly east of a large dairy. The triangular site is bounded by Avenue 136 to the north, by Road 32 to the east, and by Central Valley Hwy/SR 43 on the southwest.

3.8.2 Description of Site

Site CS5-A is in a rural area and consists of three farmland parcels with one dwelling in the northeast corner. The impacts of using this site would be the loss of agricultural land on a temporary basis and the potential relocation of the occupants of one dwelling.

3.8.3 Criteria Met

Site CS5-A is along Central Valley Hwy/SR 43 and along the HSR right-of-way. The area does not encroach on any floodplains or environmentally sensitive areas. There is adequate area to stage the necessary construction equipment and materials. Because the site is in an undeveloped area, it should have minimal interference with pedestrians, bicyclists, and transit. The proposed access from Central Valley Hwy/SR 43 to this site would be via Avenue 136 and via Road 32. There are no proposed road closures. Local roads would need to be repaired or refinished upon completion of construction in this location because the wearing to the existing roadway elements would be excessive.

CS5-A is in a rural location and has a flat topography; there are no foreseen restrictions on equipment use by horizontal clearances or by existing geometric road conditions.

3.8.4 General Size, Shape, and Location

The three parcels total approximately 168 acres, and the area is triangular. This site is adequate in size and is ideal in location.

3.8.5 Site Summary

Site CS5-A is adequate in size and is located near construction areas. The occupants of one dwelling may need to be relocated and one structure may need to be demolished. The proposed site is adjacent to the HSR right-of-way and provides access to service roads and to construction areas.

3.9 Construction Staging Area 5-B

3.9.1 General Location

Site CS5-B is 5 miles southeast of Corcoran and is directly south of a large diary. The site is bounded by the dairy to the north, Avenue 128 to the south, an unidentified road to the west, and by BNSF on the east (see **Figure 3.9-1**).

3.9.2 Description of Site

Site CS5-B is in a rural area and consists of one farmland parcel with one dwelling in the southeast corner. The impacts of using this site would be the loss of agricultural land on a temporary basis and the potential relocation of the occupants of one dwelling.

3.9.3 Criteria Met

Site CS5-B is along Central Valley Hwy/SR 43 and along the HSR right-of-way. The area does not encroach on any floodplains or environmentally sensitive areas. There is adequate area to stage the necessary construction equipment and materials. Because the site is in an undeveloped area, it should have minimal interference with pedestrians, bicyclists, and transit. The proposed access from Central Valley Hwy/SR 43 to this site would be via Avenue 128. There are no proposed road closures. Local roads would need to be repaired or refinished upon completion of construction in this location because the wearing to the existing roadway elements would be excessive.

CS5-B is in a rural location and has a flat topography; there are no foreseen restrictions on equipment use by horizontal clearances or by existing geometric road conditions.

3.9.4 General Size, Shape, and Location

The single parcel of land is approximately 164 acres. This site is adequate in size and is a good alternative to CS5-A as it is on the west side of the BNSF, similar to the HSR alignment in this location.

3.9.5 Site Summary

Site CS5-B is adequate in size and is located near construction areas. The occupants of one dwelling may need to be relocated and one structure may need to be demolished. The proposed site is adjacent to the HSR right-of-way and provides access to service roads and construction areas.

Figure 3.9-1
Site CS5-A and CS5-B

CALIFORNIA
High-Speed Rail Authority

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Section 4.0

Construction Laydown Areas

4.0 Construction Laydown Areas

4.1 Construction Laydown Area Criteria

The Construction Laydown Areas are different from Construction Staging Areas in that they are required for a short period of time to construct large steel truss bridges over major railways, highways, and waterways. There are 6 Construction Laydown Areas identified in this memo. In contrast to the precasting and construction staging locations, these laydown areas are determined by the location of the steel truss structures, and therefore the same criteria cannot be used to assess these locations. The criteria used during the selection process for the laydown areas are size and accessibility.

It is important to note that laydown area for structures specifically to cross waterways may by necessity be located within floodplains. The permitting/mitigation for locating these sites within the floodplains and any associated restrictions on construction will be the responsibility of the Authority and/or contractor.

4.1.1 Accessibility

The selected locations need to be easily accessible in order to transport the large steel members to their erection sites.

4.1.2 Size

The temporary Construction Laydown Areas are site-specific but should typically be between 10 and 30 acres in rural areas, to provide the contractor with sufficient space to erect the steel bridge structures. Construction Laydown areas located in the urban environment will not meet these criteria, due to the limited availability of temporary areas.

4.2 Construction Laydown Area 1

4.2.1 General Location

Site CL1 is approximately 7 miles north of Hanford and half a mile north of site CL2. It is the laydown area for the steel structure over Central Valley Hwy/SR 43. There are no floodplains within this area.

4.2.2 Accessibility

The site is in a rural area, and the land is used for agriculture. Part of a parcel of land would need to be acquired on a temporary basis, until the construction of the bridge is complete. The site is adjacent to Central Valley Hwy/SR 43, which would provide construction access. No road closures would be necessary for this site.

4.2.3 Size

CL1 is 16 acres. The parcel of land is used for agriculture, and no buildings would be directly affected.

CL1 is shown with CL2 and CL3 in **Figure 4.4-1**.

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4.3 Construction Laydown Area 2

4.3.1 General Location

Site CL2 is approximately 9 miles north of Hanford. This is the laydown area for the steel structure over Cole Slough. This site is within a floodplain.

4.3.2 Accessibility

The site is in a rural area and the land is used for agriculture. A single parcel would need to be acquired on a temporary basis, until the construction of the bridge is complete. S Highland Avenue (Central Valley Hwy/SR 43) is approximately 0.2 miles west of CL1, and the proposed construction access would be via private roads on either side of Cole Slough. No road closures would be necessary for this site.

4.3.3 Size

CL2 is 10 acres. The parcel of land is used for agriculture, and no buildings would be directly affected. CL2 meets the minimum size discussed for a temporary Construction Laydown Area.

4.4 Construction Laydown Area 3

4.4.1 General Location

Site CL3 is approximately 0.4 miles south of site CL2 and is the laydown area for the steel structure over Dutch John Creek. This site is within a floodplain.

4.4.2 Accessibility

The site is in a rural area, and the land is used for agriculture. A single parcel would need to be acquired on a temporary basis, until the construction of the bridge is complete. S Highland Avenue (Central Valley Hwy/SR 43) is approximately 0.2 miles west of CL3, and the proposed construction access for the north parcel would be a private road on the south side of Cole Slough. The proposed construction access for the south parcel would be via Denver Avenue to 9½ Avenue. No road closures would be necessary for this site.

4.4.3 Size

CL3 is 33 acres. The two parcels of land are used for agricultural use, and no buildings would be directly affected.

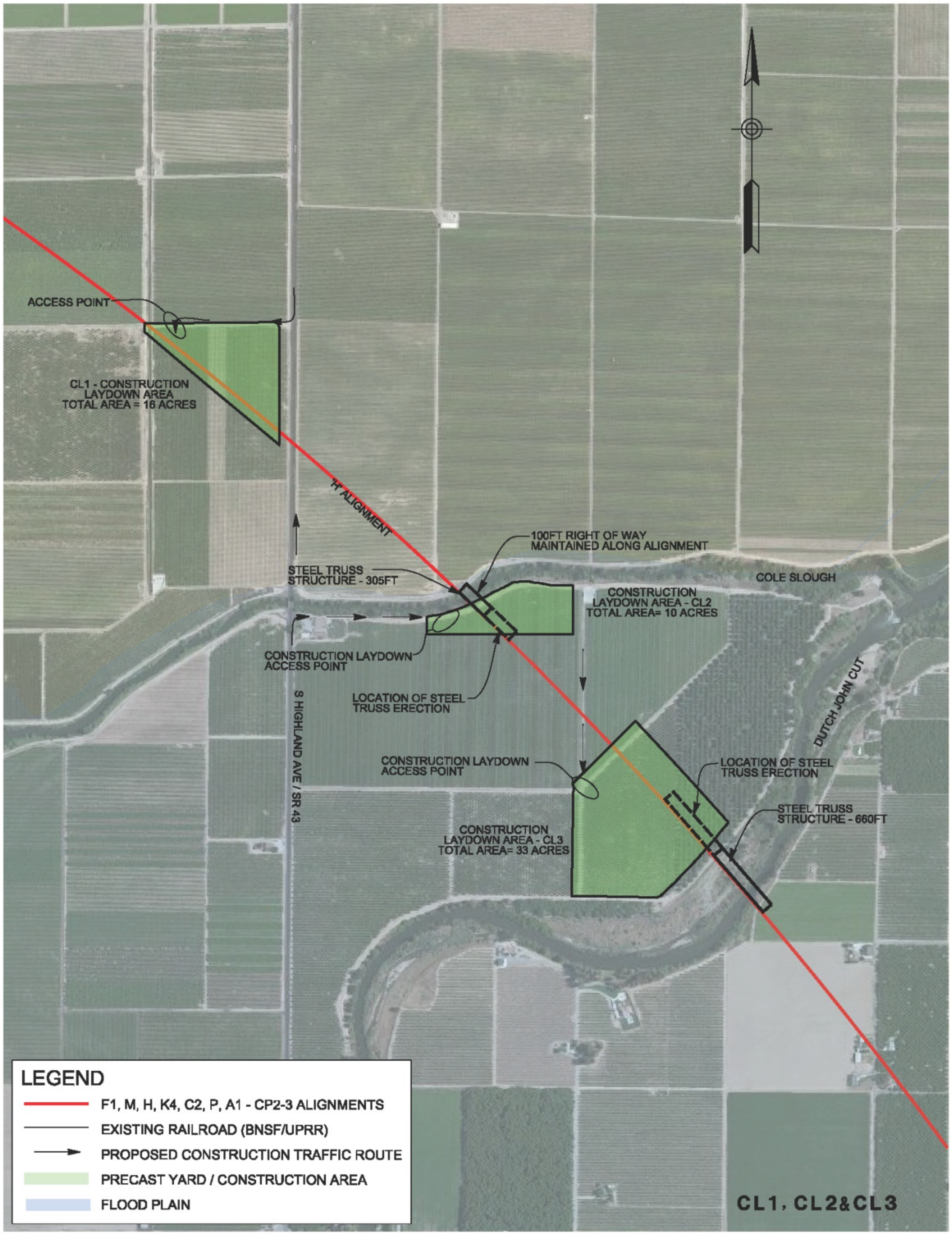

Figure 4.4-1
Sites CL1, CL2 & CL3

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4.5 Construction Laydown Area 4

4.5.1 General Location

Site CL4 is approximately 5 miles south of site CL3 and is the laydown area for the steel structure over Kings River (see **Figure 4.5-1**). This site is within a floodplain.

4.5.2 Accessibility

The site is in a rural area, and the land is used for agriculture. A single parcel would need to be acquired on a temporary basis, until the construction of the bridge is complete. S Highland Avenue (Central Valley Hwy/SR 43) is approximately 1.2 miles west of CL4, and the proposed construction access for the north parcel will be 8½ Avenue via the Denver Avenue exit off S Highland Avenue (Central Valley Hwy/SR 43). The proposed construction access for the south parcel would be via Denver Avenue to 9½ Avenue. No road closures would be necessary for this site.

4.5.3 Size

CL4 is 14 acres. The parcel of land is used for agriculture, and no buildings would be directly affected.

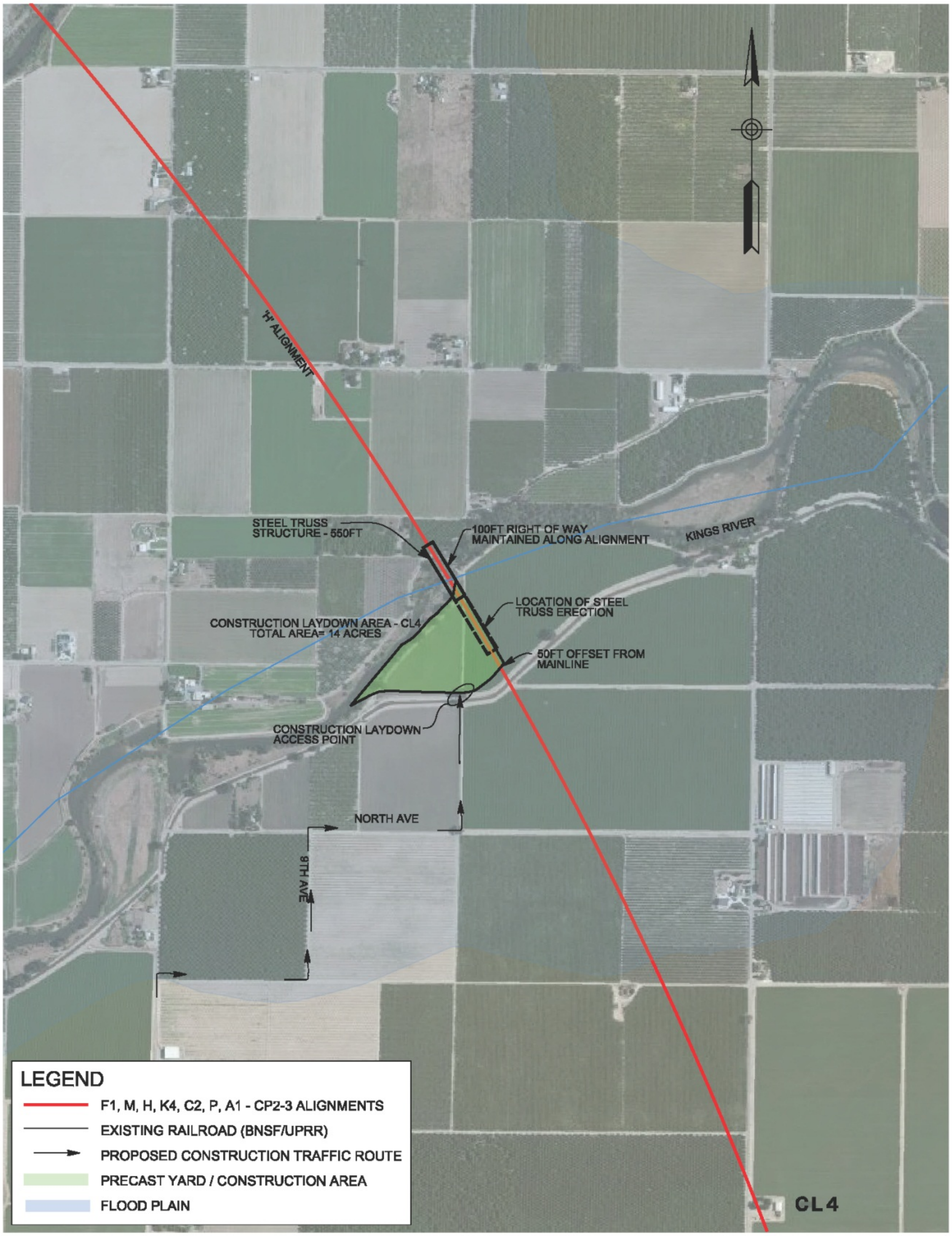

Figure 4.5-1
Site CL4

4.6 Construction Laydown Area 5

4.6.1 General Location

Site CL5 is approximately 7 miles south of Hanford and 3.5 miles south of site CS5. It is the laydown area for the steel structure over Central Valley Hwy/SR 43 (see **Figure 4.6-1**). There are no floodplains within this area.

4.6.2 Accessibility

The site is in a rural area, and the land is used for agriculture. Part of a parcel of land would need to be acquired on a temporary basis, until the construction of the bridge is complete. The site is adjacent to Central Valley Hwy/SR 43, which would provide construction access. No road closures would be necessary for this site.

4.6.3 Size

CL5 is 5 acres. The parcel of land is used for agriculture, and no buildings would be directly affected.

Figure 4.6-1
Site CL5

4.7 Construction Laydown Area 6

4.7.1 General Location

Site CL6 is approximately 11 miles south of Hanford and 5 miles northwest of the city of Corcoran. It is a laydown area for the steel structure over Cross Creek (see **Figure 4.7-1**).

4.7.2 Accessibility

The site is in a rural area, and the land is used for agriculture. Parts of three parcels of land would need to be acquired on a temporary basis, until the construction of the bridge is complete. The traffic volume is assumed to be low because the surrounding areas are made up of agricultural land. There are two access points. The proposed access to site CL6 will be via Central Valley Hwy/SR 43. Additional access from the west will be via 10½ Avenue. There are no proposed road closures.

4.7.3 Size

CL6 is 33 acres in total. Two parcels of land are used for agriculture; no buildings will be directly affected.

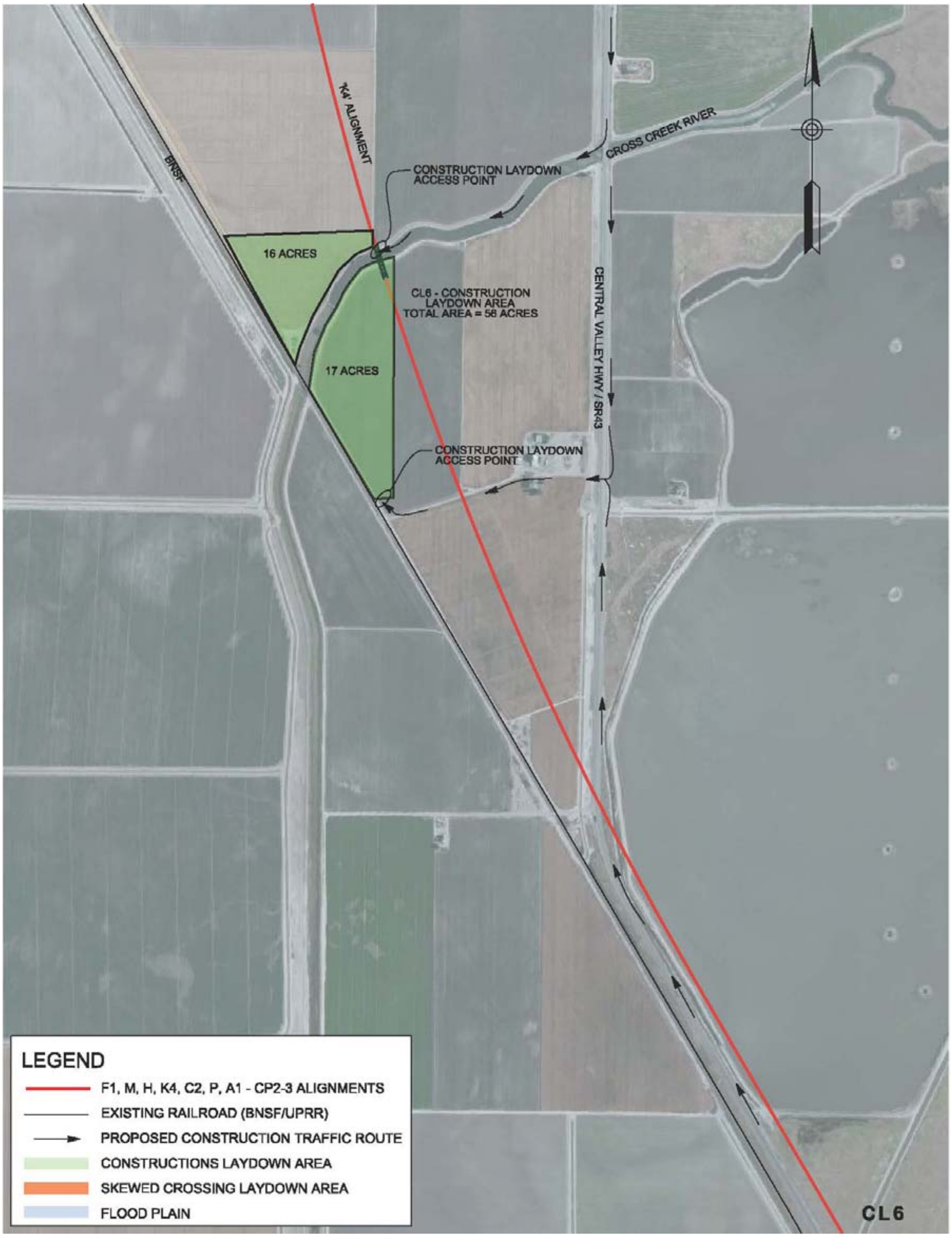

Figure 4.7-1
Sites CL6

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Section 5.0

Skewed Crossing Laydown Areas

5.0 Skewed Crossing Laydown Areas

5.1 Skewed Crossing Laydown Criteria

The Skewed Crossing Laydown Areas are similar to Construction Laydown Areas in that they are required for a short period of time to construct elevated concrete crossover structures over existing railroads and highways. There are two Skewed Crossing Laydown Areas identified in this memo. In contrast to the precasting and construction staging locations, these laydown areas are determined by the location of the elevated crossover structures, and therefore the same criteria cannot be used to assess these locations. The criteria used during the selection process for the laydown areas are size and accessibility.

It is important to note that laydown area for structures specifically to cross existing railroads may by necessity be located within floodplains. The permitting/mitigation for locating these sites within the floodplains and any associated restrictions on construction will be the responsibility of the contractor.

5.1.1 Accessibility

The selected locations need to be easily accessible in order to transport the large concrete girders to their erection sites.

5.1.2 Size

The temporary Skewed Crossing Laydown Areas are site-specific but should typically be between 5 and 10 acres, to provide the contractor with sufficient space to erect the elevated crossover structures over BNSF.

5.2 Skewed Crossing Laydown Area 1

5.2.1 General Location

Site SCL1 is 4½ miles north of the city of Laton. This is a Skewed Crossing Laydown Area specifically required for the construction of an elevated crossover structure over the BNSF railroad at this location. The site is bounded by E Conejo Avenue to the north, by BNSF railroad to the west, an unidentified road to the south, and by S Topeka Avenue to the east (see **Figure 5.2-1**). The site consists of three parcels of undeveloped land. This area would service the skewed crossing of the H Alignment over BNSF at this location. No documented environmentally sensitive areas or floodplains are in the immediate area.

5.2.2 Accessibility

The site is close to a cluster of industrial premises but no buildings are expected to be affected by this temporary Skewed Crossing Laydown Area. Three parcels of land would need to be acquired on a temporary basis, until the construction of the structure is complete. The proposed construction access to SCL1 is via Central Valley Hwy/SR 43 to E Conejo Avenue. No road closures would be necessary for this site. Local roads would need to be repaired or refinished upon completion of construction in this location because the wearing to the existing roadway elements would be excessive.

5.2.3 Size

SCL1 is 12 acres. The three parcels of land are currently undeveloped, and no buildings would be directly affected.

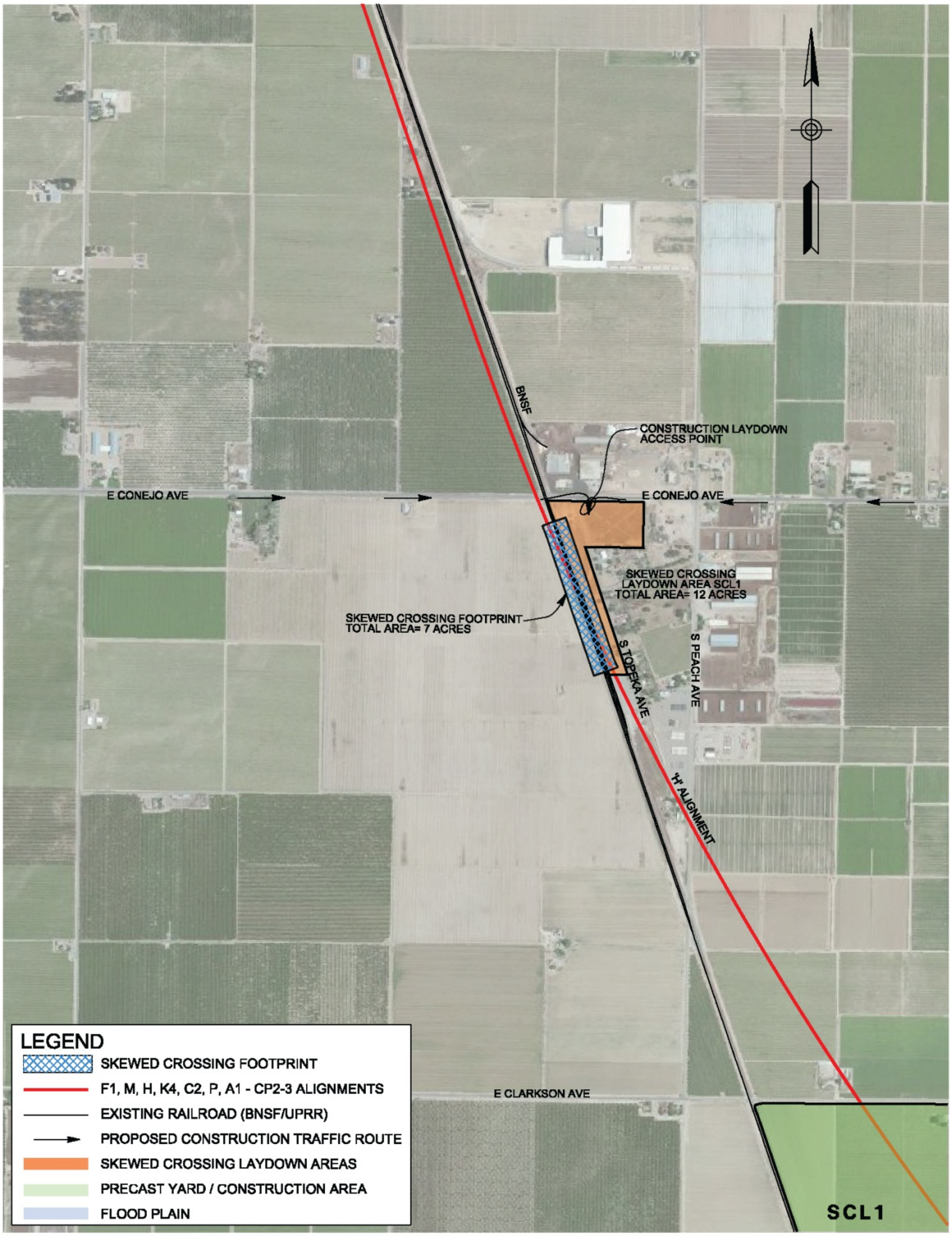

Figure 5.2-1
Site SCL1

5.3 Skewed Crossing Laydown Area 2

5.3.1 General Location

Site SCL2 is 4 miles southeast of the city of Corcoran. This is a Skewed Crossing Laydown Area specifically required for the construction of an elevated crossover structure over the BNSF railroad at this location. The site is bounded by the BNSF railway on the east and an irrigation canal on the south with Avenue 144 to the north (see **Figure 5.3-1**). The site consists of part of a large parcel of agricultural land. This area would service the skewed crossing of the C2 Alignment over BNSF at this location. No documented environmentally sensitive areas or floodplains are in the immediate area.

5.3.2 Accessibility

The site is in a rural area, and the land is used for agriculture. Part of one parcel would need to be acquired on a temporary basis, until the construction of the elevated crossover structure is complete. The traffic volume in this area is assumed low because the surrounding areas are made up of agricultural land. This site is within a floodplain. The proposed access to site SCL2 would be via Central Valley Hwy/SR 43 to Avenue 144. A temporary construction access road would need to be constructed along the alignment to access this site. There are no proposed road closures. Local roads would need to be repaired or refinished upon completion of construction in this location because the wearing to the existing roadway elements would be excessive.

5.3.3 Size

The total area of this site is 31 acres. Construction equipment requiring assembly in the staging area would be restricted by the vertical clearance of overhead power lines.

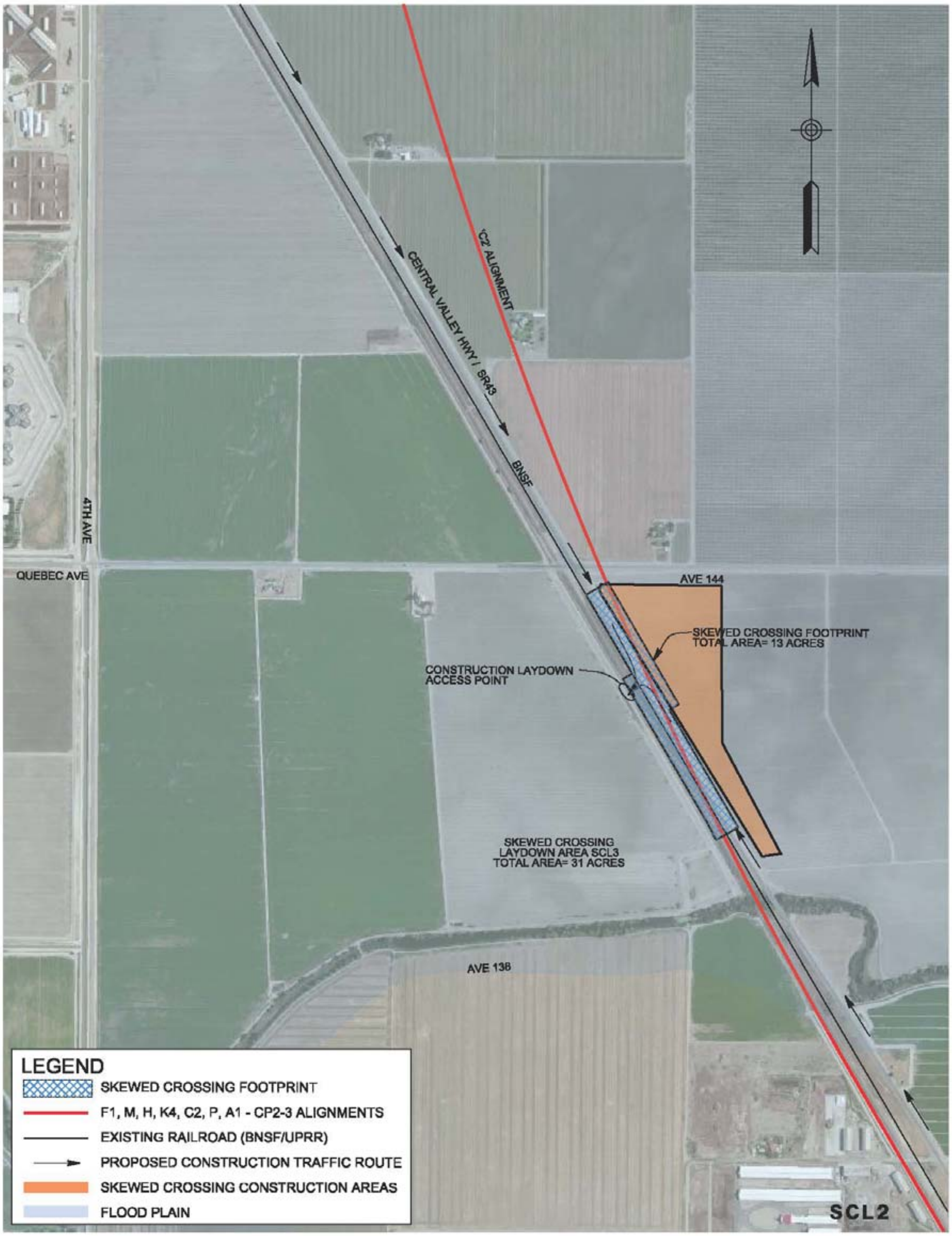

Figure 5.3-1
Site SCL2

Section 6.0

Construction Staging and Sequencing

6.0 Construction Staging and Sequencing

6.1 Construction Timing Constraints

Due to the scale of construction required for the HSR, there is a potential that the available supply of materials, equipment and skilled labor will not be able to meet the project's demand in order to meet the aggressive schedule outlined in the 2014 Draft Business Plan. The linear nature of the project presents added demand for careful logistical planning of material supply routes and infrastructure.

It is also anticipated that there will be environmental constraints to individual construction activities throughout CP2-3, for example bird nesting seasons and seasonal flooding. Due to the overall anticipated construction duration it is considered that these seasonal constraints should not be critical to the overall construction schedule.

The following is a summary of key activities specific to CP2-3 that may constrain the construction schedule and impact the critical path if not properly sequenced;

- Right-of-Way acquisitions (permanent and temporary).
- Utility relocations as discussed in Section 7.6.7 and included in the FB Sierra PE4P Draft CP2-3 Basis of Quantities Report (URS/HMM/Arup Apr 2014).
- BNSF track realignments on the M and H alignments as shown on the FB 15% RS Alignment drawings (URS/HMM/Arup Jan 2014) and included in the FB Sierra PE4P Draft CP2-3 Basis of Quantities Report (URS/HMM/Arup Apr 2014).
    - Mainline realignments - Sta. 709+33 to 872+28 and Sta. 934+48 to 1062+13
    - Spur realignments – Sta. 752+00 to 823+00 and Sta. 1134+85 to 1156+89
- Canal Realignments and Retention Basins on the M, H, K4, C2, P and A1 alignments as shown on the FB 15% RS Alignment drawings (URS/HMM/Arup Jan 2014) and included in the FB Sierra PE4P Draft CP2-3 Basis of Quantities Report (URS/HMM/Arup Apr 2014).
- Wildlife Crossings within the K4, C2, P, A1 and L1 subsections.
- Rerouting of roadways as shown on the FB 15% RS Alignment drawings (URS/HMM/Arup Jan 2014).
- Avoid planning construction activities in the fourth quarter of the year that will impact BNSF operations as this is their busiest time of year.
- Timely order and delivery of long lead items such as the prefabricated steel truss sections.

The major critical path construction activity for CP2-3 is anticipated to be the 7.24 miles of standard viaduct construction. This activity is expected to take 27 months starting 6 months after the commencement of the contractor mobilization which includes setting up the necessary staging areas and precasting facilities. The assumed 6 month lag is to take account of the time required for concrete testing before full scale concrete operations can commence. A period of 3 months is assumed to demobilize and close out the project. This is a total of 33 months and assumes that the Contractor is not delayed by enabling works outside of their control such as third-party utility relocations and BNSF railroad relocations.

An alternate construction schedule has been developed which has a total duration of 50 months as a result of reducing the number of assumed working locations from six to four. This highlights the impact that resources and location constraints can have on a construction schedule.

Note that this is a preliminary assessment of the expected construction durations and assumes that long lead items such as the fabrication and delivery of the steel members for the 6 steel trusses will not impact the critical path.

6.2 Enabling Works

To enable the construction of the heavy civil engineering works (earthworks, and viaducts), it will be important to implement enabling works including the following:

- Right-of-way acquisition.
- Obtaining necessary construction permits.
- Set up staging areas and precasting facilities.
- Set up worker health, safety and welfare facilities.
- Set up contractor administration offices.
- Site clearance and demolition.
- Construct construction access roads.
- Critical utility relocations and protection works.
- Canal relocations.
- Railroad relocations.
- Permanent grade crossing closures.

If the temporary construction facilities identified in sections 3, 4 and 5 are acquired and cleared early in the construction schedule, they will provide flexibility to stage and sequence construction activities.

Carrying out utility relocations before the main works commence will allow for more efficient excavations, grading and foundation construction. The staging areas will need to be connected to the utility networks (water, electricity, telecommunications) as early as possible.

Closing grade crossings that are to be permanently closed at the start of the construction schedule will improve access between different areas of the project for construction traffic. This however may be constrained by diversion routes necessitated by nearby grade separation construction.

6.3 Construction Quantities

Table 6.3-1 and **Table 6.3-2** below provides a summary of the major quantities anticipated in CP2-3. These quantities have been used to develop an opinion of probable construction sequence and duration and are based on FB Sierra PE4P Draft CP2-3 Basis of Quantities Report (URS/HMM/Arup Apr 2014). Refer to appendix B for the preliminary construction schedules.

Table 6.3-1
HSR Alignment Quantities

CP2-3	At grade (miles)	Retained Fill (miles)	Standard Viaduct (miles)	Complex Viaduct Concrete (miles)	Complex Viaduct Steel (miles)	Total Viaduct (miles)	Total (miles)
F	0.75	-	-	-	-	-	0.75
M	8.24	-	-	-	-	-	8.24
H	12.95	2.06	3.86	1.16	0.42	5.44	20.45
K4	6.70	1.45	1.58	0.09	0.08	1.76	9.92
C2	7.62	0.79	0.61	0.46	0.02	1.09	9.49
P	6.88	-	-	-	-	-	6.88
A1	8.02	0.78	1.18	-	-	1.18	9.98
Total	**51.16**	**5.08**	**7.24**	**1.71**	**0.52**	**9.47**	**65.70**

Table 6.3-2
Major Project Quantities

CP2-3	Railroad Relocations – Mainline (miles)	Railroad Relocations – Spur (miles)	Roadway Overcrossing Structures (Each)	Wildlife Crossings (Each)	Hydraulic Crossings (Each)	Canal Relocations (miles)
F	-	-	-	-	1	-
M	5.5	3.31	7	-	20	1.36
H	-	1.52	12	-	23	0.60
K4	-	-	4	3	32	2.33
C2	-	-	2	18	49	2.26
P	-	-	4	20	22	2.52
A1	-	-	1	29	19	3.35
Total	**5.5**	**4.83**	**30**	**70**	**166**	**12.43**

6.4 Typical Construction Sequencing and Durations

The following is anticipated to be the main construction activities for CP2-3:

- Permanent and temporary right-of-way acquisitions by Authority.
- Contractor mobilization – Staging area/s, precasting facilities and supporting offices.
- Critical area utility relocations (by contractor and/or third parties).
- Railroad relocations.
- Canal relocations.
- Hydraulic crossings.
- Wildlife crossings.
- Berm construction.

- Demolition – buildings and roadway structures.
- HSR at-grade earthwork construction.
- HSR retained fill construction.
- HSR viaduct construction (standard and non-standard).
- Roadway overcrossing structures.
- Roadway modifications.
- Demobilization.

There are a number of variables that must be considered when planning and sequencing a construction project of this size and complexity. The contractor's preferred means and methods as well as the availability of labor, material and equipment resources will play a major part in the decision making process for sequencing the work.

The RC has developed a preliminary construction schedule (see Appendix B) to determine the expected critical path activities and the overall construction duration. As discussed in 6.1, the standard viaduct construction is expected to be the driving critical path activity; however, there are a number of near critical activities including the non-standard viaducts and roadway overcrossings. The following assumptions were made in developing this preliminary construction schedule:

- All right-of-way acquisition is completed in advance of contractor on site mobilization.
- All necessary agency agreements to stage the works are in place before contractor on site mobilization, such as road closures, BNSF agreements from mainline and spur relocation and utility diversions/relocations.
- The critical third-party utility relocations are completed in advance of the main civil infrastructure works commencing and the contractor is not delayed as a result of delays to utility relocations outside of their control.
- The contractor will be able to acquire the construction staging areas identified in section 3.0, 4.0 and 5.0 and take immediate possession of these temporary sites in order to efficiently sequence and construct the works.
- A concrete batching/ precasting facility will be set up in staging area CS3A and/or CS3B and the standard viaduct superstructure will be precast segmental, while the non-standard viaduct superstructure will be CIP.
- CS1 and CS2 will be used for staging the mostly at grade work between Fresno and KTR station.
- CS5 will be used for staging the work between Cross Creek river and the southern limit of CP2-3.
- The critical utility relocations commence two weeks after mobilization and are completed in twelve months.
- The production rate of the standard viaduct foundation and bent construction is expected to be 4 feet/day while the production rate for the non-standard concrete structures is expected to be 1 foot/day. The RC has assumed that a single crew will construct two bents in 30 days and that there is a total of 6 crews working concurrently in different locations.
- The standard viaduct superstructure is expected to be precast segmental which will follow the foundation and bent construction by one month.
- Each of the 6 steel trusses is expected to take nine months on average with two trusses being constructed concurrently. We have assumed 27 months for all six truss structures.
- The 30 roadway overcrossings are expected to take a total of 24 months assuming 15 crossings are completed each year.
- No major constraints have been applied to resources.
- An alternate schedule has been provided in Appendix B which assumes four concurrent working locations for the standard and non-standard concrete viaduct construction.

Section 7.0

General Construction Methods

7.0 General Construction Methods

This section presents a brief summary of the proposed construction methods for each of the components of the HSR.

7.1 Clearing and Grubbing

After mobilizing and setting up the construction staging area(s), the contractor will commence with clearing and grubbing the HSR right-of-way in advance of the major buiding, roadway and utility relocations. This activity involves clearing natural and manmade obstacles such as trees, shrubs, signs, etc. Stripping a layer of topsoil in advance of the excavation activity may also occur at this stage.

7.2 Demolition

The next stage of construction will involve the demolition of building and roadway structures directly impacted by the HSR. Before the demolition work can commence, the building occupants and roadways will need to be relocated. There is a considerable amount of planning required in advance of commencing demolition work. A demolition survey will need to be carried out and a plan developed on how the structures will be demolished. If any hazardous materials such as asbestos are identified, a specialist will need to be brought in to remove and dispose of hazardous materials in a safe and controlled manner. Once these steps occur and the structures are ready to be demolished, the actual demolition activity can be completed expeditiously. A typical two story building can be demolished in a single day.

7.3 Earthwork

The earthwork activity involves the movement of soil from one location to another and the process of forming the soil (or earth) into a desired shape. The earthwork component of the HSR project will be extensive and involve the use of large construction machinery such as the following:

- Dozers.
- Motor graders.
- Scrapers.
- Excavators.
- Off-road earth haul units (trucks).
- On-road earth haul units (trucks).
- Water trucks.
- Earth compaction equipment.

Within the job site, earthmoving will be done using conventional methods. For very short distances (less than 300 feet), dozers will be used to shift earth. For distances from 300 feet up to 2,500 feet scrapers will be used. For distances greater than 2,500 feet (e.g., when moving earth for underpasses and overpasses), trucks will be employed. There will be a need to import fill material as there are no cut sections on CP2-3, only excavations associated with viaduct foundation structures. The identification and acquirement of suitable borrow sites will be the contractors responsibility. It is anticipated that suitable borrow sites will be available within a 30-mile radius of the project.

The contractor will also be responsible for the stripping and removing any unsuitable materials (contaminated and/or hazardous) which will require off-site disposal to the appropriate waste facility.

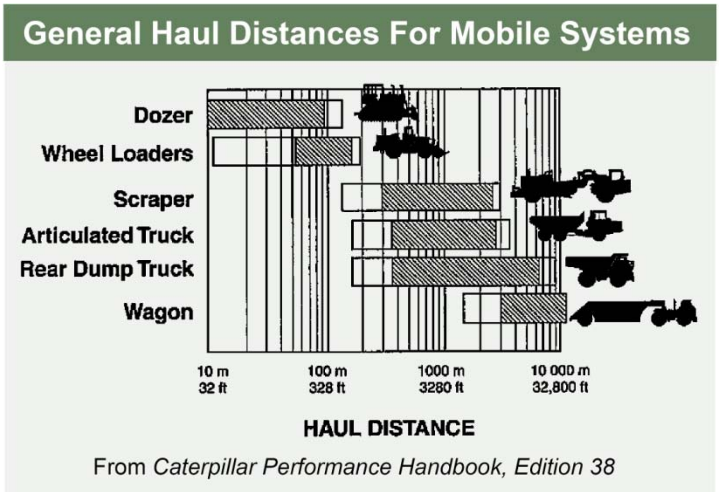

Figure 7.3-1
General Haul Distances

7.4 Highways/Roadways

The proposed HSR alignment will require road and highway realignments. Some of the realignments are associated with grade separations, and some are required due to the proposed HSR alignment. The proposed realignment or modifications are shown on the roadway plans. It is anticipated that highway and roadway work associated with the HSR Project will be done using conventional methods, in the following sequence as necessary:

- Demolition.
- Utility relocations (utility relocation timing may influence highway work schedule), which could require trenching, segmental pipe construction, concrete pipe or conduit poured in-situ, storm drain catch basins poured in-situ or placing pre-cast units.
- Excavation.
- Grading.
- Placing aggregate base.
- Constructing concrete curb and gutter (in some cases may be carried out before the previous stage), which can be done by building forms and pouring concrete in place, or by using a curb and gutter placing machine.
- Placing concrete or asphalt concrete top surface base and top surfaces.
- Coordination with all local agencies and Caltrans (for state highways) will be required as final design progresses.

7.5 Drainage

The drainage requirements of the HSR project need to do the following:

- Maintain existing drainage flow patterns.
- Disperse on-site runoff to encourage local infiltration.
- Incorporate existing drainage systems.
- Improve existing drainage capacity if the HSR exacerbates existing drainage problems or flooding at a location where the existing system is known to be undersized.
- Treat runoff from pollution-generating impervious surfaces to the maximum extent practicable to meet water quality objectives and water quality standards set forth by the California Regional Water Quality Control Board (RWQCB) before discharging to receiving waters.

The at-grade or track on embankment segments will require drainage ditches or swales on both sides of the track to collect rainfall. The emphasis will be placed on on-site retention of runoff which will require the construction of detention basins. These basins will be unlined and will be designed to remove litter, settleable solids (debris), total suspended solids, and pollutants.

For embankment segments supported by retaining walls, trackbed drainage will be collected and conveyed in a pipe system. Storm drains may also be incorporated behind the top of the retaining walls to accommodate peak events. All concentrated flow will be addressed in a non-eroding manner.

Tracks set below grade or in a trench section will have drainage systems to collect stormwater and direct it to a pump station. Stormwater will be pumped to a retention basin outside the trench and released into a drainage facility.

For elevated track segments, where the HSR crosses an unpaved rural landscape, the runoff will be collected and conveyed in pipes down the sides of the pier columns to infiltration swales. Where the guideway crosses developed urban areas, the runoff will again be conveyed in pipes down the sides of the piers but usually will be discharged into the local storm water drainage system.

7.6 Structures

Table 7.6-1 below provides a summary of the significant structures in CP2-3.

Table 7.6-1
Summary of Significant Structures in CP2-3

Name	Approximate Start Station (ft)	Approximate End Station (ft)	Description of Location	Approximate Length[1]
At-grade	577+00	1086+00	From E American Ave to south of Willow Ave	50,600 ft
Retained	1086+00	1105+70	From south of Willow Ave to north of Conejo Ave	2,000 ft
Aerial	1105+70	1156+20	From north of Conejo Ave to south of Peach Ave	5,100 ft
Retained	1156+20	1173+50	From south of Peach Ave to north of Clarkson Ave	1,700 ft
At-grade	1173+50	1452+50	From north of Clarkson Ave to north of Highland Ave	27,900 ft
Retained	1452+50	1464+77	From north of Highland Ave to Highland Ave	1,200 ft
Bridge	1464+77	1467+90	From Highland Ave to Highland Ave	300 ft
Retained	1467+90	1479+68	From Highland Ave to north of Cole Slough	1,200 ft
Aerial	1479+68	1596+52	From north of Cole Slough to south of the Kings River	11,700 ft
Retained	1596+52	1622+50	From South of Kings River to north of Douglas Ave	2,600 ft

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Name	Approximate Start Station (ft)	Approximate End Station (ft)	Description of Location	Approximate Length[1]
At-grade	1622+50	1885+40	From north of Douglas Ave to north of Fargo Ave	26,300 ft
Retained	1885+40	1903+57	From north of Fargo Ave to north of Grangeville Blvd	1,800 ft
Aerial	1903+57	2008+37	From north of Grangeville Blvd to south of SR 198	10,500 ft
Retained	2008+37	2023+48	From south of SR-198 to north of Hanford Armona Rd	1,500 ft
At-grade	2023+48	2240+32	From north of Hanford Armona Rd to SR - 43	28,700 ft
Bridge	2240+32	2246+06	From SR-43 to SR-43	600 ft
At-grade	2246+06	2436+00	From SR-43 to south of Tulare Ave	19,000 ft
Retained	2436+00	2446+81	From south of Tulare Ave to south of Tulare Ave	1,100 ft
Aerial	2446+81	2538+71	From south of Tulare Ave to SR-43	9,200 ft
Retained	2538+71	2583+63	From SR-43 to SR-43	4,500 ft
At-grade	2583+63	2966+50	From SR-43 to south of Ave 152	38,600 ft
Retained	2966+50	2989+36	From south of Ave 152 to north of Ave 144	2,300 ft
Aerial	2989+36	3046+02	From north of Ave 144 to Tule River	5,600 ft
Retained	3046+02	3064+70	From Tule River to south of Ave 136	1,800 ft
At-grade	3064+70	3982+20	From south of Ave 136 to north of Deer Creek	45,700 ft
Retained	3982+20	4005+25	From north of Deer Creek to Deer Creek	2,300 ft
Aerial	4005+25	4067+65	From Deer Creek to south of Stoil Spur	6,200 ft
Retained	4067+65	4085+95	From south of Stoil Spur to south of Stoil Spur	1,800 ft
At-grade	4085+95	4435+50	From south of Stoil Spur to north of Kern County Line	35,000 ft

[1] Structure details do not include width and height due to ongoing design.

7.6.1 HSR Viaduct Structures

The HSR superstructure will be formed of decks and girders that are either precast or cast in situ. Variations in span length will be accomplished by changing mold lengths and cross sections. Although such variations will result in higher mold costs, the greatest plant investments — the lifting, transporting, and erection equipment — will be unaffected. With a wide top flange to accommodate both tracks and walkways, and near vertical webs below each track, the most economical sectional shape for a rail viaduct is a trapezoidal girder. In locations where it is not practical to use the standard box girder type, other structural types have been proposed, such as trusses, balanced cantilevers, and elevated crossover structures. For spans exceeding 200 feet, a steel truss structure is most likely to be the only option unless the track level is raised to permit much deeper balanced cantilever structures.

The Regional Consultant has identified the following complex and nonstandard structures as representative examples of the structure types within CP2-3 of the HSR:

- Conejo Structure
- Dutch John Cut
- Kings/Tulare Station
- Kaweah State Route (SR) 43 Crossing
- Corcoran Crossover Structure

These structures have been the subject of detailed analysis to determine their capability for further development into compliant designs.

The Conejo Viaduct is composed of three sections: the E Conejo Avenue standard viaduct, the BNSF crossing, and the S Peach Avenue standard viaduct. The BNSF crossing is a large structure that is conceived as a slab supported on multiple columns to either side of the BNSF railroad corridor. The slab section is assumed to be constructed by placing precast beams across the railway supported on deep in situ concrete column cap beams that run parallel to the railway. The 6-foot-diameter columns are positioned at 30-foot centers along the length of the structure and are founded on a single 9-foot diameter pile of approximately 170 feet in depth.

Dutch John Cut is a two-span truss structure that crosses one channel of Kings River. As the channel capacity is controlled by levees to limit flooding, the structure has been designed to provide a minimum maintenance clearance to the top of the levee of 18 feet which has been agreed in discussion with the Kings River Conservation District (see *Hydrology, Hydraulics and Drainage Report*). Additionally the structure over-spans the levee with two 350-foot spans to avoid issues with permitting.

Kings/Tulare Station (Hanford) has been modeled as a series of in situ concrete post-tensioned girders to accommodate areas of the alignment where turnout switches are required. The structure provides additional space beside the turnouts which is potentially useful as laydown space for equipment associated with track and switch maintenance. The location of the turnouts dictates areas of the structure where joints are not permitted and which therefore determines the span configuration to be used.

The Kaweah SR 43 Crossing is a half-through steel girder bridge of two spans. This form was chosen to minimize the depth of the underpass cutting and also to allow the route to cross SR 43 at high skew, avoiding extensive realignment of the highway.

The Corcoran Crossover Structure is similar to the Conejo Crossover structure but has two spans and is located in a higher seismic zone.

Please refer to the Draft PE4P CP2-3 Nonstandard and Complex Structures Report (URS, HMM, Arup February 2014) for more details.

There are various means and methods that the contractor can utilize to construct the HSR viaduct structures. The RC has assumed the Precast Segmental Span by Span Method (PSSSM) for the standard structures in developing the preliminary construction schedule included in Appendix B. Precast I beams and Cast-In-Place (CIP) methods are assumed for the non-standard crossover structures over BNSF and both lifting and incrementally launching is expected for erecting the steel structures. Other methods available to the contractor are Full Span Precast Launching Method (FSPLM), Balanced Cantilever Construction (BCC) and Moving Scaffolding System (MSS). The benefits and drawbacks of each option are discussed in the following sections of this report.

7.6.1.1 Precast Segmental Span by Span Method (PSSSM)

For this type of construction, concrete segments of 10 to 12 foot in length are precast in an-offsite precasting facility and delivered to site by trucks using the road network or along the previously constructed deck. Span-by-Span bridges provide very high speed of construction, and can be constructed over or parallel to existing highways with little or no impact on traffic. Precast segmental bridges can be constructed using an erection truss under the segments or using an overhead erection gantry as shown in **Figure 7.6-1**. The spans are lifted into place, the joints are treated and the deck is post-tensioned to complete the span construction cycle. This method of construction is expected to be used for all standard spans within CP2-3.

Figure 7.6-1
Deep Bay Link Bridge in Hong Kong, PSSSM using overhead gantry

(Photo courtesy Arup)

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7.6.1.2 BNSF Concrete Crossover Structures

These are nonstandard concrete structures that utilize precast beam to bridge over the BNSF.

The slab section is constructed from 6-foot-deep, precast, PC beams and supported on 12-foot-deep by 24-foot span in situ concrete column cap beams, which run parallel to the railway. The beams span approximately perpendicular to the BNSF tracks and are placed immediately adjacent to one-another; typically this gives a spacing of 4 feet on centers. The deck slab is 6 inches in thickness and is intended to act compositely with the beams. The superstructure has been divided into individual thermal units of approximately 150- to 200-foot length to reduce the thermal displacement and force effects. Movement between adjacent thermal units is controlled with dowelled connections, which allow relative longitudinal displacements but not relative transverse displacement.

The standard spans of the viaduct are formed from precast, prestressed box girders and seated on RC columns, which are in turn supported on a pile cap with a group of 4no. 6-foot-6-inch-diameter drilled shaft piles. Due to clearance constraints near to the BNSF right-of-way and reduced loading, the columns immediately adjacent to the crossover structure modify the general foundation arrangement by using a two-pile group with a narrower pile cap. This method of construction will expected to be used for the Conejo and Corcoran crossover structures.

7.6.1.3 Full Support Method or Cast-in-Place

Full support method (FSM)/cast-in-place (CIP) is the most traditional construction method of viaduct construction. The superstructure formwork is supported directly off the ground using substantial scaffold and formwork/falsework. This type of construction is generally the slowest and most labor intensive of all viaduct construction methods. However, this method does have considerable advantages where it is not practical to construct the viaduct in sequence span by span.

FSM/CIP is also the most flexible form of construction because the contractor can reallocate resources from one site to another and the pace of construction can be geared to the availability of resources and program priorities. This type of construction will be used for all the pile caps and columns as well as the deck for the two crossover structures mentioned above.

Figure 7.6-2
Staging and Falsework Supporting the Formwork for In Situ Construction

(Photo courtesy Taiwan High Speed Rail Corporation [THSRC])

7.6.1.4 Incremental Launching Method

Bridge construction using the Incremental Launching Method (ILM) is not very common in the United States. With this method of construction, the bridge is usually constructed from one side and then launched into place using mechanical jacks. It is also possible to launch from both sides of the obstacle to be crossed, but this can be more expensive due to the requirement for two sets of jacking equipment and supporting equipment or sliding bearings. This method of construction is generally very expensive due to the requirements for a considerable amount of design analysis, specialized construction equipment, and contractor knowledge/experience. However, ILM should be considered when access to a site is extremely limited or if the construction is over an environmentally protected area where other means and methods are not feasible.

ILM can be applied to bridges made of either steel or concrete. Concrete bridges built using this method are normally cast in stationary forms behind an abutment with each new segment cast directly against the preceding one. Once the concrete has cured, the entire structure is launched to create sufficient room for casting the subsequent segment. A steel bridge constructed by ILM is completely assembled (typically one segment at a time), including steel cross bracing, prior to launching.

There are two systems that the contractor can use in order to reduce the cantilever moments and the amount of deflection that occurs during launching, and sometimes both systems may be used. A tapered launching nose on the leading end of the girder can be installed to reduce the dead load of the cantilever span and to assist in lifting the mass of the girders as they are launched forward onto the landing pier. Alternatively, the contractor may elect to use a kingpost system utilizing temporary stays to reduce the deflection of the leading end of the girders during launching.

Figure 7.6-3
ILM Equipment Used on the Tou Chien Bridge, Second Freeway, Taiwan

(Photo courtesy Wiecon)

7.6.1.5 Steel Truss

Steel truss structures can be used when long spans are required to cross waterways or major roadways, and where clearance between the structure and the freeway is an issue. Steel truss structures are generally more expensive than conventional CIP or precast structures, but they may be the best solution for spans between 210 and 360 feet if a balanced cantilever is deemed no longer suitable.

A larger staging area is required for this type of bridge construction as the steel truss sections are prefabricated and delivered to the site. At the site, they are assembled and launched or hoisted into place using a self-launching system or crane, respectively. The ILM usually requires space beyond one end of the final structure for assembly of the components prior to launch. Often this space is available on the approach embankments. In areas where the spans are located in the middle of a viaduct, a temporary staging platform may be required for assembly. When assembled, the truss bridge will be slid into place utilizing a long-nose cantilever.

Alternatively, where the alignment is already elevated, the steel truss structure could be lifted into position using a crane and traditional placement methods. As the spans of the truss are large, such lifts are likely to be tandem lifts (two cranes) or major parts of the whole span rather than complete spans.

For steel structures with two or more spans, a continuous steel truss method may be used — the structure extends without hinges or joints across three or more supports. This type of structure is likely to use less material than a series of simple trusses because a continuous truss distributes live loads more effectively than a simply supported truss structure does. However, there are dynamic performance issues with two-span trusses deriving from the interaction between spans under torsional excitation, and the use of single-column center supports could mean that simply supported spans are still preferred.

Figure 7.6-4
Warren Truss Steel Bridge, Used on Taiwan HSR Project, Taiwan

(Photo courtesy Wiecon)

Refer to PE4P CP 2-3 Draft Non-Standard and Complex Structures Report (URS/HMM/Arup Feb 2014) for more information specific to the structures in CP2-3.

7.6.1.6 Full-Span Precast Launching Method

FSPLM is the construction industry equivalent of just-in-time mass production. This technique requires the establishment of a dedicated fabrication yard alongside the route of the viaduct HSR where the girders are prefabricated under factory-like conditions. The girders weigh upward of 700 US tons each. The girders are cast in molds and allowed to cure, after which a completed girder is lifted from the yard onto a self-propelled traveling gantry, which travels along the already completed guideway to where the girder is to be lifted into place. This type of construction is the fastest known construction method but requires considerable up-front investment by the contractor in the fabrication yard, lifting equipment, and traveling gantries.

After the foundations and bents have been completed, the bulk of the follow-on construction activities will be at the superstructure level. The completed guideway will be the primary route for access. This form of construction is particularly suited to long continuous viaducts. There may not be enough continuous viaduct in CP2-3 to make this an economical option.

Figure 7.6-5
FSPLM Launching/HSR System under Construction in Taiwan, ROC pic 1

(Photo courtesy THSRC)

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Figure 7.6-6
FSPLM Launching/HSR System under Construction in Taiwan, ROC pic 2

(Photo courtesy THSRC)

7.6.1.7 Free Cantilever Method/Balanced Cantilever Construction

The free cantilever method (FCM)/balanced cantilever construction (BCC) allows the superstructure to be constructed in a segmental manner from the top of a bent. Segments can be precast off-site and brought to site on the back of a low loader, where they will be lifted in place extended outward from the bent. The size of the precast segment is usually constrained by accessibility, meaning that segments transported by road rarely exceed 10 to 12 feet in length or weigh more than 70 US tons.

Alternatively, where ground access is severely limited, the segments can be cast in situ and the formwork advanced segment by segment across the span. Segments are held in place by prestressing. FCM/BCC is particularly useful for constructing longer spans and for crossing rivers, railroads, and roadways where ground support might not be practical. CIP segmental construction is often used where nonprismatic sections are used to reduce depth (and weight) at midspan. In these situations, girder stems are often made vertical to facilitate mold depth adjustment.

Figure 7.6-7
Balanced Cantilever, STAR Light-Rail Transit, Kuala Lumpur, Malaysia

(Photo courtesy Arup)

7.6.1.8 Movable Scaffolding System / Advance Shoring System

The movable scaffolding system (MSS) and advance shoring system (ASM) are based on a system where the main formwork is erected between two adjoining bents. The girder is then cast in place. After curing, the formwork is not dismantled but is instead pushed forward to the next span where the casting and curing is repeated. There is no need to reassemble the formwork at the next span.

The formwork is mechanically advanced and is supported at all times off the HSR structure bents. This technique is considered one of the fastest methods of in situ construction but is only economical where there is a continuous series of spans.

Figure 7.6-8
MSS in Place Awaiting In Situ Construction, Taiwan HSR, ROC

(Photo courtesy THSRC)

Figure 7.6-9
MSS Moving Forward to the Next Span, Bent Construction Well Advanced of the Girder Placement, Taiwan HSR, ROC

(Photo courtesy THSRC)

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7.6.2 Roadway Structures

There are 30 roadway structures in CP2-3. It is anticipated that the bridges will be of standard forms commonly found on rail and highway projects.

These structures are likely to be pre-cast concrete or preformed steel beams with a cast in place concrete deck. In order to keep existing rail services operational (where applicable), the structures may need to be partially constructed before transferring services to the new structure, demolishing the existing structure and completing the construction of the new structure.

7.6.3 Open Trench Excavation

There are no open trench sections in CP2-3.

7.6.4 Cut and Cover Tunnel

There are no cut and cover sections in CP2-3.

7.6.5 Bored Tunnels

There are no bored tunnel sections in CP2-3.

7.6.6 Retaining Walls

Retaining Walls will be used on the approaches to structures where there is no room for embankments. The retaining walls may be constructed using conventional CIP methods or by the Mechanically Stabilized Earth (MSE) method which uses precast concrete facing panels and either metal or fabric reinforcement between layers of compacted engineered fill to create embankment with vertical or near-vertical sides. Conventional CIP walls are required for HSR retained fill adjacent to systems sites.

An example of an MSE wall under construction is shown in the figure below.

Table 7.6-2
MSE Wall, Route 85/US 101 (South) Interchange Project, CA

7.6.7 Utility Relocations

The relocation of utilities requires extensive advance planning and coordination with utility owners. This is a high risk to the HSR project in terms of possible cost and schedule impacts and as a result, the PE4P design for CP2-3 includes the identification of and proposed relocations for utilities located in areas considered critical. Critical areas are determined by the RC and the Program Management Team (PMT) based upon cost, schedule, environmental footprint, and utility impact issues with railroads and along fault lines where those factors could significantly affect the construction package. For CP2-3, nine Critical Areas, covering approximately 35 miles of the 66 miles of the CP2-3 project length, were identified.

The most salient technical and non-technical issues anticipated involve development of a scheduling and contracting arrangement that allows for relocation of High Voltage (HV) transmission lines in a fashion that does not inhibit the construction of the HSR track bed and ancillary local roadway overpasses. Approximately 4.5 miles of the Pacific Gas and Electric Company (PG&E) 115 kilovolt (kV) Kingsburg–Corcoran transmission lines between approximate Stations 1740+00 (near Excelsior Road) and 1985+00 (south of Highway 198) on the H alignment will require horizontal and vertical relocation to accommodate the HSR right-of-way. HV lines in smaller, isolated areas elsewhere within the CP2-3 project limits will also require similar relocations. It is anticipated that PG&E will be responsible for the final design and construction of the necessary relocations. This work must precede the construction of the trackbed and roadway overpasses.

Relocation of fiber optic communication lines located within, or directly adjacent to, BNSF freight rail right-of-way also presents scheduling challenges because this work must be coordinated with both the relocation of the freight rail track and the HSR track bed construction. Fiber optic communication line relocation is required between approximate Stations 709+50 and 872+00, Stations 935+00 and at Station 739+00 (East South Avenue roadway overpass) 1056+00, on the M alignment and approximate Stations 1119+00 and 1156+00 on the H alignment.

There are also a number of natural gas lines, categorized as high risk that will require relocation. Gas lines requiring relocation are for the most part relatively short reaches of pipe crossing HSR or roadway grade separations of HSR. Both PG&E and Southern California Gas (Sempra Energy) own gas mains within the project area and it is anticipated that they will perform the final design and relocation work.

Significant water mains, categorized as high risk when they are over 8-inches in diameter or operate at 80 psi or greater, exist only in the City of Corcoran. The CP2-3 C2 alignment passes between the City's Water Treatment Plant on Orange Avenue and its Storage Tank/Booster Station site on Pickerel Avenue. In addition to the HSR trackbed, a roadway overpass for Corcoran Highway is proposed in this area. Both will impact large diameter water mains critical to the operation of the City's water system. Relocation and, in a number of cases encasement of water mains, ranging in diameter from 8-inch to 30-inch will be required.

No active oil wells are currently within the CP2-3 project footprint, however, two plugged wells fall within the 1000-foot assessment zone as identified in the FB Oil Wells Map book – see appendix C.

7.6.8 Trackwork

The HSR track type has not yet been determined by the Authority, however, the RC does not anticipate any constructability issues with regards to trackwork.

7.6.9 Systems

The RC is of the opinion that there are no systems sites in CP2-3 that have specific constructability issues. There are a number of sites that are in the vicinity of new roadway overpasses/ access roads and the clearing and grubbing of the sites would need to be coordinated with the overpass and access road construction.

Section 8.0

Traffic Control and Detours

8.0 Traffic Control and Detours

8.1 Construction Access and Traffic

Personnel, materials, and equipment will be staged from a number of staging areas evenly spaced between Fresno and Allensworth. Staging and laydown areas have been identified in section 3.0, 4.0, 5.0 and included in the environmental footprint, however, the final selection and configuration of these staging areas will ultimately be the responsibility of the contractor. To avoid logistical inconveniences for both construction crews and for the public, movements of materials and equipment will be made using the HSR right-of-way wherever practical.

Local and interstate highways will be affected by the movement of materials and equipment, and the contractor will be required to develop a Construction Transportation Plan to minimize this issue. This plan will address, in detail, the activities to be carried out in each construction phase, with the requirement of maintaining traffic flow during peak travel periods. Such activities include, but are not limited to, the routing and scheduling of materials deliveries, materials staging and storage areas, construction employee arrival and departure schedules, employee parking locations, and temporary road closures, if any. The plan will provide traffic controls pursuant to the *California Manual on Uniform Traffic Control Devices* sections on temporary traffic controls (Caltrans 2012) and will include a traffic control plan. Refer to section 3.2.2 of the Final Environmental Impact Report/Statement (FEIR/S) for more detail on the minimum requirements for the traffic control plan.

During the development of the FB 15% and PE4P design, the RC has been involved in high level discussions with Caltrans and the various local jurisdictions. These discussions focused on the details of the design and did not include specific restrictions with regards to construction access and traffic control. The assumptions made in the Traffic Analysis portion of the FEIR/EIS regarding roadway overpass construction is that two consecutive overpasses would not be constructed at the same time in order to minimize traffic impacts.

There are two state route roadway underpasses within CP2-3. On the K4 alignment, the SR43 is depressed under the HSR at Jackson Avenue (station 2242+00). There is sufficient space within the project footprint to accommodate a transitioning the SR43 traffic onto a temporary roadway during the excavation of the undercrossing. Refer to Appendix D for an exhibit showing the proposed phasing during construction.

Whitley Avenue/SR137 is also getting depressed under HSR at station 2813+00). There is not enough space within the project footprint to temporarily transition the traffic so it will need to be rerouted along Corcoran Highway (Waukena Avenue) during the construction of the underpass.

Major construction traffic components are as follows:

- Import of construction materials, such as
  - Fuel, oil.
  - Water.
  - Concrete.
  - Steel.
  - Cement.
  - Aggregates.
  - Fill material.

- Mobilization/demobilization of equipment.
- Daily movements of craft labor.
- Export of earth or other unsuitable materials.

Planned traffic detours and modifications to existing traffic flows will be required for construction of roadway overpasses and for periodic hauling operations. Please refer to section “3.2 Transportation” of the EIR/EIS for a more discussion relating to construction impacts on traffic.

The CP2-3 segment of the HSR crosses a region with a well-defined road network, making site access easy and flexible. The job site consists of the HSR right-of-way, which is typically 60 feet wide along elevated sections and 120 feet to 135 feet wide for at-grade sections. For safety, security, and logistics reasons, this right-of-way area will be fenced and access will be controlled. Access to the site will be via specific gates along the right-of-way, strategically located with easy access to roads and freeways.

8.2 Pedestrian Detouring and Access

As the extents of CP2-3 are generally within rural areas, there will be limited requirements for pedestrian detouring and access. No pedestrian detouring and access analysis has been undertaken to date.

Section 9.0

Construction Utilities

9.0 Construction Utilities

The precasting and staging facilities require a full range of standard utilities, including construction power, potable and industrial water, communications, drainage, and sewer. Ideally, existing utilities will have sufficient capacity. In the event they are not sufficient, the site selection considers the proximity of existing utility connections.

9.1 Construction Power

The temporary construction facilities may require a significant amount of electricity depending on whether or not a new precasting and/or batching facility are required. The contractor will need to work with the utility company to bring electricity to these temporary construction locations. For construction along the HSR corridor, power can be obtained by the use of temporary generators.

9.2 Construction Water

Construction water is likely to be drawn from multiple sources along the right-of-way. During the winter months, water may be collected from the ditch alongside the rail bed and impounded. Other potential water sources include temporary-permit wells, negotiated access to irrigation canals and pipelines, or water imported in trucks if necessary.

9.3 Other

In addition to construction power and water, the temporary construction facilities will require additional services such as communications, drainage and connections to the sewer network. No constructability issues with regards to construction utilities are anticipated for CP2-3.

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Section 10.0

Third-Party Coordination and Agreements

10.0 Third-Party Coordination and Agreements

10.1 Utilities

Third-party coordination with utility owners within the CP2-3 project area has been ongoing since 2009. The PE4P coordination with agencies having facilities within CP2-3 consisted of requesting updated utility information focused on the preferred alignments for each of the foregoing construction packages. Data from those agencies which had responded with new or updated utility information through January 2014 was organized and inserted into the existing utility base file. Additional information which is received from agencies after January 2014 will be used to update the existing utility base file and will be tracked in a programmatic fashion. Agreements with Third-Parties are being completed by the Third-Party Coordination and Agreement team and therefore, are not discussed in this report.

Initial utility coordination meetings were convened with those agencies having significant utilities within the project area. Local agency meetings were arranged on a prioritized basis, focused on those agencies willing to meet with the regional consultant and owning facilities within Critical Areas. The initial meetings were introductory in nature and were used to encourage timely responses to the 'A' letters, establish lines of communication between the regional consultant and the point of contact within the local agencies, and to confirm areas of conflict and local agency standards applicable to relocations. It is anticipated that follow-up communication and meetings will be conducted with many of these agencies to review the concept level relocation plans developed for Critical Areas in CP2-3.

Initial coordination meetings have been conducted with the following agencies:

- Fresno Irrigation District
- Corcoran Irrigation District
- City of Corcoran
- Public Service Electric & Gas
- Southern California Gas (Sempra Energy)

The PMT coordinates and negotiates Master Agreements with local agencies owning utilities within the HSR project area. The agreements, commonly referred to as Third-Party Agreements, provide a reimbursement vehicle for reimbursement to affected agencies for costs to respond to requests for existing utility mapping, meetings to review agency standards and proposed utility relocation plans, and where applicable, for local agency staff to assist in development of the relocation plan details. Refer to appendix E for a table showing third party coordination undertaken to date.

10.2 Railroads

The RC has not been involved in discussions with the UPRR and BNSF railroads and therefore cannot provide commentary on the coordination and agreements that have occurred with the railroads to date. Some of the main constraints on the FB 15% design that came out of discussions between the Authority's representatives and the railroad companies are as follows:

- Required distance of HSR from existing UPRR and BNSF alignments.
- Definition of operational right-of-way.
- Requirement for shooflys and underbridges.
- Relocations within railroad right-of-way.
- Spur tracks.

10.3 Local Jurisdictions

Throughout the development of the 15% Design and the EIR/EIS, there has been interaction with the local jurisdictions from Fresno to Bakersfield. The RC has reviewed and incorporated local criteria into the roadway design as well as input/feedback received from the agencies on the proposed design. City of Fresno, Fresno County and Kern County have provided the most feedback through meetings and written comments. The RC, to the maximum extent possible, has incorporated the agency comments into the 15% Design. Where the design does not meet the local criteria, the RC has prepared a Design Exception for submittal to the local agency.

The RC has been coordinating the reviews of designs on impacted State facilities in CP2-3. The designs at the impacted locations are developed, and then reviewed and commented on by Caltrans. Comment resolutions are being developed for impact locations where comments were received.

The comments received generally reflect the following requests and requirements:

- HSR crossing over or under State facilities should accommodate ultimate Caltrans right-of-way and expansion, which may or may not be documented or consistent with current right-of-way or planning documents.
- HSR access roads should avoid intersecting State facilities, unless other access points are not conveniently available.
- Proposed designs for impacted locations should be designed according to Caltrans design standards. Nonstandard features should be documented with Design Exception Fact Sheets.

Section 11.0

Potential Excavation Hazards

11.0 Potential Excavation Hazards

11.1 Flammable Gasses and Hydrocarbons

The geotechnical investigations to date have not uncovered any excavation hazards related to flammable gasses and/or hydrocarbons.

11.2 Cobbles and Boulders

The geotechnical investigations to date have not uncovered any excavation hazards related to cobbles and boulders.

11.3 Tunneling through Fault Zones

There are no tunnels in CP2-3.

11.4 Contamination

The PE4P GI does not include an environmental evaluation of alignment for contaminated soils or groundwater. Neither contaminated soils nor contaminated groundwater were encountered during the GI for CP2-3; however, no access to King County was granted. There is a risk of encountering surficial sources of contamination. Characterization of contamination is beyond the scope of the PE4P GI. Please refer to the FB Final EIR/EIS for discussion on potential environmental contamination (PEC).

11.5 Obstructions

The geotechnical investigations to date have not uncovered any excavation hazards related obstructions.

11.6 Existing Openings

The geotechnical investigations to date have not uncovered any excavation hazards related to existing openings.

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Section 12.0

Right-of-Way Acquisition

12.0 Right-of-Way Acquisition

The footprint of the HSR was used to assess the right-of-way impacts and consists of the HSR track corridor, systems sites, maintenance of infrastructure facilities, and associated roadway relocations and crossings. There are both permanent and temporary right-of-way impacts associated with the HSR. Temporary and permanent easements occur in areas outside of the permanent right-of-way for the project that are required for construction. These areas may include utility relocations, contractor staging areas, or work to conform to existing private facilities.

12.1 Summary of Right-of-Way Design

Permanent impacts occur within the project's permanent right-of-way, which includes aerial, at-grade, and depressed tracks; roadways; stations; traction power substations; radio communication sites; maintenance of infrastructure facilities (MOIF); and a heavy maintenance facility (HMF). The footprint for the track is defined as 60 feet wide in aerial sections; however, certain complex structures require up to 300 feet in permanent right-of-way. For the at-grade sections, the footprint varies between 100 feet and 150 feet wide, depending on the height of the fill required. The footprints for the roadways are defined by the outer limits of the embankments or cuts of the grade separations plus areas needed for drainage detention basins. The areas denoted as HSR stations are included in the footprint.

The RC gathered existing right-of-way information from the counties within this section from the digital assessor's parcel map data, specifically the assessor's parcel number and the parcel size. The parcel information and HSR footprint were displayed in a geographic information system (GIS) format, and the overlapping area was recorded as the necessary right-of-way for the CP2-3 alignment.

The majority of parcels will require a partial acquisition of their total area, resulting in a remainder that is not needed for the project. In some cases, a full acquisition of the parcel was determined to be necessary. This will be the case if the RC observed that either (a) the remainder is not a viable economic unit that retains its highest and best use or (b) the impact to remaining land and improvements is too great to continue to function. In other cases, damages to an area of a parcel were determined to be necessary. An area was classified to be damaged if the RC observed that there will be no legal access, in addition to the criteria used for full acquisitions.

A summary of land and improvement base unit values, denoted by parcel land use classifications, is included **Table 12.1-1**.

Table 12.1-1
Parcel Land Use Classifications Base Value Information

Classification	Description	Size	Unit Value		
			($/ac)	Site Improvements	Severance
Land Only					
A1, A1.1	Ag w/ & w/o Imp	<10 Ac	$35,000	20%	40%
		>10 Ac	$25,000	20%	40%
	Ag Farm Ind	All	$100,000	10%	40%
A1 & A1.1 Blend	HMF and Mainline Through HMF Site	All	$54,950	20%	20%
C1, C1.1, O1, O1.1, M	Com, Office, & Motel w/ & w/o Imp	<0.75 Ac	$900,000	20%	10%
		0.75–2.00 Ac	$525,000	20%	10%
		>2.00 Ac	$435,000	20%	10%
I1,I1.1,I2,I2.1	Light & Heavy Ind w/ & w/o Imp	<5 Ac	$305,000	15%	10%
		>5 Ac	$250,000	15%	10%
R1, R1.1	SF Residential w/ & w/o Imp	All	$200,000	25%	20%
R2, R2.1	MF Residential w/ & w/o Imp	All	$250,000	25%	20%
MH	Mobile Home Park	All	$1,000,000	20%	10%
OS	Open Space/Park	All	$350,000	—	20%
P	Pasture/Fallow	All	$20,000	—	10%
IMPROVEMENTS ONLY					
I1.1 & I2.1	Ind Buildings	All	$50/ft^2 plus or minus*		
C1.1 & O1.1	Com Buildings	All	$75/ft^2 plus or minus*		
A1.1 & R1.1, R2.1, MH	Res Improvements	All	Lump Sum Based on Comparable Listings		

*Cost was adjusted for quality, condition, and age of the improvement.

Ag = agricultural
Imp = improvements
Ind = industrial
MF = multifamily
Com = commercial
HMF = heavy maintenance facility
Res = residential
SF = single family

12.2 Right-of-Way Impact Summary

The RC tabulated the total area in acres of estimated right-of-way impacts, including full and partial takes, by land use classification, HSR alignment, and proposed use within the CP2-3 alignment. The Record Set 15% Preliminary Right-of-Way Requirements Report estimated temporary easements and permanent right-of-way area and cost. A summary of this information is shown in **Table 12.2-1** Back-up files, in GIS format, are available to support the following information.

Table 12.2-1
CP2-3 Right-of-Way Impact Summary

	Cost (in Millions)		Acres		
Alignment	**Right-of-Way**	**Temporary Easements**	**Right-of-Way**	**Easements**	**Number of Parcels**
F	$192.4	$14.7	220	95	211
M	$34.1	$0.4	436	5	174
H	$96.0	$11.7	979	475	193
K4	$23.4	$2.0	360	65	55
C2	$38.7	$6.9	440	360	87
P	$19.8	$0.2	289	7	31
A1	$77.2	$5.5	2069	157	146
Totals	**$481.6**	**$41.4**	**4793**	**1164**	**897**

* Based on the January 2014 Record Set 15% Preliminary Right-of-Way Requirements Report.

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Section 13.0

Groundwater Management

13.0 Groundwater Management

The groundwater region that the HSR alignment passes through is known as the Tulare Lake Hydrologic Region. The hydrologic region is characterized by groundwater conditions that are artificially lowered, locally variable in quality and depth groundwater conditions and subject to increasing usage demands. Groundwater levels fluctuate with seasonal rainfall, withdrawal, and recharge. The large demand for groundwater has caused subsidence in some areas of the Valley, primarily along its western side and southern end (CDWR 2003). Depth to groundwater in the SJV ranges from a few inches to more than 300 feet. "The project study area is within the SJV Groundwater Basin and crosses through five of its seven sub-basins: Kings, Tulare Lake, Kaweah, Tule, and Kern" (*FB Section: Hydrology and Water Resources Technical Report* 2012).

13.1 Historical Groundwater Levels

Table 13.1-1 summarizes the historical groundwater levels along the alignment over the past 50 years according to various sources at the California Department of Water Resources (CDWR 2011a) website, including groundwater wells along the alignment.

Table 13.1-1
Groundwater Table Depths - feet (CDWR 2011b)

Location	Existing Grade (ft NAVD88)	Period				
		1960–65	1984–88	1998–2001	2005	2009–11
E Morton Avenue	289	29	26	32	52	63
Bowles	275	33	34	52	65	76
Conejo	261	36	41	59	81	90
E Davis Street	258	38	26	43	63	76
Denver Avenue	275	22	23	29	60	83
Dover Avenue	265	27	25	47	70	
Excelsior Avenue	264	24	44	68	82	
Elder Avenue	265	45	43	72	96	102
Flint Avenue	260	50	60	88	107	115
Fargo Avenue	257	67	66	95	112	125
Grangeville Blvd	250	50	70	95	125	130
Lacey Blvd	248	83	73	88	110	
Iona Avenue	240	80	80	97	144	152
Idaho Avenue	232	77	50	85	129	144
Kansas Avenue	221	121	4	71	112	141
Lansing Avenue	216	110	23	33	89	85
Nevada Avenue	212	57	32	42	102	
Corcoran	209	51	29			

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Location	Existing Grade (ft NAVD88)	Period				
		1960–65	1984–88	1998–2001	2005	2009–11
Avenue 144	211	67	15	20	41	51
Tule River	209	44	19			
Avenue 128	208	63	26	29	53	70
Avenue 112	203	61	43			
Avenue 88	212	77			162	
Deer Creek	210	82	60			
Allensworth	214	74	54	134	149	149
Avenue 24	224	74	54			
K/T County Line	244	80	59	64	64	

The *FB Geologic and Seismic Hazards Report* (URS/HMM/Arup 2013a) shows a general trend of groundwater fluctuation along the HSR alignment. All of the groundwater levels identified above are approximate, subject to seasonal fluctuations, and likely more representative of mean low conditions. The published groundwater table depths are for the unconfined aquifer and take no account of localized high-level perched groundwater tables, deeper confined aquifers, or potentially artesian or subartesian groundwater conditions.

13.2 Current Groundwater Levels

Groundwater levels measured during this investigation are shallower than the measurements shown in **Table 13.1-1** for the period between 2009 and 2011, but they are within the range of measurements shown for other historical periods.

In general, the results of the RC observations and measurements in boreholes and CPTs in Fresno County indicate the groundwater depths increase to the south. Between Jefferson Avenue and Manning Avenue, groundwater is generally between 40 and 80 feet bgs; between Manning Avenue and Davis Avenue, the results of our investigation indicates it drops to between 80 and 105 feet bgs and is deepest near Conejo; south of Davis Avenue to the Kings County line, the groundwater table fluctuates slightly but generally rises to the south. The RC observations and measurements in this area indicate groundwater is between about 50 and 90 feet (shallower near the Kings River).

In Tulare County, the results of the RC studies indicate groundwater levels are generally between 20 and 50 feet. In the vicinity of Avenue 56, where large percolation ponds are present, the results of pore pressure dissipation tests in the CPTS indicated the water table can be as shallow as between 5 and 10 feet. Shallow measurements and observations of perched groundwater was generally noted between Avenue 88 in Tulare County and the Kern County line, at depths varying from about 5 to 15 feet.

The results of geophysical testing indicate perched groundwater may be present between 65 and 70 feet in borehole S0028R (in Conejo) and between 32 feet and 45 feet in borehole S0067R at Avenue 144 in Tulare County.

Current groundwater measurements and observations have not yet been performed for sections of the alignment within Kings County. The historical measurements shown in **Table 13.1-1** indicate the range in depths to the groundwater may vary from about 20 feet to more than 100 feet bgs.

13.3 Land Subsidence

The *FB Geologic and Seismic Hazards Report* (2013c) discusses regional subsidence in detail. The areas of subsidence identified by researchers at the Jet Propulsion Laboratory (JPL 2013) indicate subsidence along the alignment during a period of observation between June 2007 and December 2010.

Development of an established instrumentation and monitoring plan specifically tailored to gaining the maximum amount of information about the performance of the HSR is crucial for the long-term functionality of the project. The instrumentation plan should be designed to gather sufficient data to support recommendations for mitigation measures. It is assumed that regular inspection of the entire route of the HSR will be part of the operating plan.

Please refer to the FB Sierra PE4P CP2-3 Geotechnical Data Report (URS/HMM/Arup Jan 2014) for more information.

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Section 14.0

Construction Pollution Control

14.0 Construction Pollution Control

14.1 Air Quality

Section 3.3 of the FB FEIR/EIS describes the regulatory and environmental setting associated with the air quality and global climate changes for the study area affected by the HSR project, the potential impacts on air quality and global climate change that would result from the project, and mitigation measures that would eliminate or reduce these impacts.

The San Joaquin Valley Air Pollution Control District (SJVAPCD) is responsible for implementing air quality regulations and rule **8011: General Requirements – Fugitive Dust Control Measures** must be adhered to as a matter of law. The SJVAPCD Rule 8011 requirements are listed below:

- All disturbed areas, including storage piles, which are not being actively used for construction purposes, will be effectively stabilized for dust emissions using water or a chemical stabilizer/suppressant, or covered with a tarp or other suitable cover or vegetative ground cover.
- All onsite unpaved roads and offsite unpaved access roads will be effectively stabilized for dust emissions using water or a chemical stabilizer/suppressant.
- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities will be effectively controlled for fugitive dust emissions by an application of water or by presoaking.
- With the demolition of buildings up to six stories in height, all exterior surfaces of the building will be wetted during demolition.
- All materials transported offsite will be covered or effectively wetted to limit visible dust emissions, and at least 6 inches of freeboard space from the top of the container will be maintained.
- All operations will limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden.
- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles will be effectively stabilized for fugitive dust emissions using sufficient water or a chemical stabilizer/suppressant.
- Within urban areas, trackout will be immediately removed when it extends 50, or more, feet from the site and at the end of each workday.
- Any site with 150, or more, vehicle trips per day will prevent carryout and trackout.

In addition to the above requirements, a number of avoidance and minimization, control and mitigation measures have been outlined that the design-build contractor needs to be aware of and abide by.

The programmatic control measures and their corresponding emissions reductions include the following:

- Replacing ground cover in disturbed areas (PM, 5%).
- Watering exposed surfaces three times daily (PM, 61%).
- Watering unpaved access roads three times daily (PM, 61%).
- Reducing speed on unpaved roads to 15 miles per hour (PM, 45%).
- Ensuring that trucks hauling loose materials are covered (PM, 69%).
- Using low-VOC paint (VOCs, 10%).
- Washing all trucks and equipment before exiting construction sites.
- Suspending dust-generating activities when wind speeds exceed 25 mph.

Avoidance and minimization measures that are part of the project are as follows:

- Trucks will be covered to reduce significant fugitive dust emissions while hauling soil and other similar material.
- All trucks and equipment will be washed before exiting the construction site.
- Exposed surfaces and unpaved roads will be watered three times daily.
- Vehicle travel speed on unpaved roads will be reduced to 15 miles per hour.
- Any dust-generating activities will be suspended when wind speed exceeds 25 mph.
- All disturbed areas, including storage piles that are not being actively used for construction purposes will be effectively stabilized for dust emissions using water or a chemical stabilizer/suppressant, or covered with a tarp or other suitable cover or vegetative ground cover. In areas adjacent to organic farms, non-chemical means of dust suppression will be used.
- All onsite unpaved roads and offsite unpaved access roads will be effectively stabilized for dust emissions using water or a chemical stabilizer/suppressant. In areas adjacent to organic farms, non-chemical means of dust suppression will be used.
- All land clearing, grubbing, scraping, excavation, land leveling, grading, cut and fill, and demolition activities will be effectively controlled for fugitive dust emissions by an application of water or by presoaking.
- With the demolition of buildings up to six stories in height, all exterior surfaces of the buildings will be wetted during demolition.
- All materials transported offsite will be covered or effectively wetted to limit visible dust emissions, and at least 6 inches of freeboard space from the top of the container will be maintained.
- All operations will limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden.
- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, piles will be effectively stabilized for fugitive dust emissions using sufficient water or a chemical stabilizer/suppressant. In areas adjacent to organic farms, non-chemical means of dust suppression will be used.
- Within urban areas, trackout will be immediately removed when it extends 50 or more feet from the site and at the end of each workday.
- Any site with 150 or more vehicle trips per day will take actions specified in SJVAPCD Rule 8041 to prevent carryout and trackout.
- Low- or super-compliant VOC (Clean Air) paints, coatings, and industrial coatings that meet the regulatory limits in the SCAQMD Rule 1113 will be used.

A total of 19 Air Quality Impacts are identified in the FEIR/EIS. They are as follows:

- Impact AQ #1 – Common Regional Air Quality Impacts During Construction.
- Impact AQ #2 – Compliance with Air Quality Plans.
- Impact AQ #3 – Material-Hauling Emissions Outside of SJVAB.
- Impact AQ #4 – Greenhouse Gas Emissions During Construction.
- Impact AQ #5 – Asbestos and Lead-based Paint Exposure During Construction.
- Impact AQ #6 – Localized Air Quality Impacts During Guideway/Alignment Construction.
- Impact AQ #7 – Localized Air Quality Impacts on Schools and Other Sensitive Receptors During Construction.
- Impact AQ #8 – Localized Air Quality Impacts from Concrete Batch Plants.
- Impact AQ #9 – Localized Air Quality Impacts from HMF and MOWF Construction.
- Impact AQ #10 – Regional Criteria Pollutant Emissions.
- Impact AQ #11 – Greenhouse Gas Analysis During Operation.
- Impact AQ #12 – Localized Air Quality Impacts During Train Operations.

- Impact AQ #13 – Localized Mobile Source Air Toxics Analysis.
- Impact AQ #14 – Microscale CO Impact Analysis.
- Impact AQ #15 – Localized $PM_{10}/PM_{2.5}$ Hot-Spot Impact Analysis.
- Impact AQ #16 – Localized Analysis of HMF Impacts.
- Impact AQ #17 – Localized Air Quality Impacts on Sensitive Receptors Including Schools.
- Impact AQ #18 – Odor Impacts from Operations.
- Impact AQ #19 – Compliance with Air Quality Plans.

Below is an extract from the FB FEIR/EIS which outlines the mitigation measures that the contractor must follow during construction (Authority and FRA 2014).

AQ-MM#1: Reduce Criteria Exhaust Emissions from Construction Equipment. This mitigation measure will apply to heavy-duty construction equipment used during the construction phase. All off-road construction diesel equipment will use the cleanest reasonably available equipment (including newer equipment and/or tailpipe retrofits), but in no case less clean than the average fleet mix, as set forth in CARB's OFFROAD 2011 database, and no less than 40% reduction compared to a Tier 2 engine standard for NO_x emissions. The contractor will document efforts it undertook to locate newer equipment (such as, in order of priority, Tier 4, Tier 3 or Tier 2 equipment) and/or tailpipe retrofit equivalents. The contractor shall provide documentation of such efforts, including correspondence with at least two construction equipment rental companies. A copy of each unit's certified tier specification and any required CARB or SJVAPCD operating permit will be made available at the time of mobilization of each piece of equipment. The contractor shall keep a written record (supported by equipment-hour meters where available) of equipment usage during project construction for each piece of equipment.

AQ-MM#2: Reduce Criteria Exhaust Emissions from On-Road Construction Equipment. This mitigation measure applies to all on-road trucks used to haul construction materials, including fill, ballast, rail ties, and steel. Material hauling trucks will consist of an average fleet mix of equipment model year 2010, or newer, but no less than the average fleet mix for the current calendar year as set forth in CARB's EMFAC 2011 database. The contractor shall provide documentation of efforts to secure such fleet mix. The contractor shall keep a written record of equipment usage during project construction for each piece of equipment.

AQ-MM#3: Reduce the Potential Impact of Concrete Batch Plants. Concrete batch plants will be sited at least 1,000 feet from sensitive receptors, including daycare centers, hospitals, senior care facilities, residences, parks, and other areas where people may congregate. The concrete batch plant will utilize typical control measures to reduce the fugitive dust, such as water sprays, enclosures, hoods, curtains, shrouds, movable and telescoping chutes, central dust collection systems and other suitable technology, to reduce emissions to be equivalent to the U.S. EPA AP-42 controlled emission factors for concrete batch plants.

14.2 Noise and Vibration

The noise and vibration limits chosen for construction and operation of the HSR System satisfy the federal guidelines of the FRA and Federal Transit Administration (FTA) for train and HSR facility operations and Federal Highway Administration (FHWA) as defined for California application by the California Department of Transportation (Caltrans) for traffic noise.

The construction noise analysis included in section 3.4.5.3 of the FEIR/EIS suggests that the potential for construction noise impacts will be minimal for commercial and industrial land use, with impact screening distances of 79 feet and 45 feet, respectively. For residential land use, the potential for temporary construction noise impacts would be limited to locations within approximately 141 feet of the alignment. However, the potential for noise impacts from nighttime construction could extend to residences as far as 446 feet. These impacts are temporary during construction. Under these conditions potential noise effects would have moderate intensity under NEPA and impacts would be significant under CEQA.

During construction, some equipment may cause ground-borne vibrations, most notably pile-driving equipment. Pile-driving is only expected to occur where there is the need for a bridge, aerial structure, or road crossing; and is only one of the several proposed construction methods. Construction equipment can produce vibration levels at 25 feet that range from 58 VdB for a small bulldozer to 112 VdB for a pile driver. With pile driving, there is potential for severe vibration impacts during construction that would have substantial intensity under NEPA and would be significant under CEQA. Without pile driving, the impact would have moderate intensity under NEPA and would be less than significant under CEQA.

A total of 6 noise and vibration (N&V) impacts are identified in the FEIR/EIS. They are as follows:

- Impact N&V #1 - Construction Noise.
- Impact N&V #2 - Construction Vibration.
- Impact N&V #3 - Moderate and Severe Noise Impacts from Project Operation to Sensitive Receptors.
- Impact N&V #4 - Noise Effects on Wildlife and Domestic Animals.
- Impact N&V #5 – Impacts from Project Vibration.
- Impact N&V #6 - Traffic Noise.

The Authority and the FRA have considered avoidance and minimization measures consistent with the Statewide and Bay Area to Central Valley Program EIR/EIS commitments. FTA and FRA have guidelines for minimizing noise and vibration impacts at sensitive receptors that need to be followed during construction. In addition, various mitigation measures are identified in section 3.4.7 of the FEIR/EIS to compensate for impacts that cannot be minimized or avoided. Below is an extract from the FEIR/EIS which outlines the mitigation measures that the contractor must follow during construction.

N&V-MM#1: Construction noise mitigation measures. Monitor construction noise to verify compliance with the noise limits. Provide the contractor the flexibility to meet the FRA construction noise limits in the most efficient and cost-effective manner. The contractor would have the flexibility of either prohibiting certain noise-generating activities during nighttime hours or providing additional noise control measures to meet the noise limits. To meet required noise limits, the following noise control mitigation measures will be implemented as necessary, for nighttime and daytime:

- Install a temporary construction site sound barrier near a noise source.
- Avoid nighttime construction in residential neighborhoods.
- Locate stationary construction equipment as far as possible from noise-sensitive sites.
- Re-route construction truck traffic along roadways that will cause the least disturbance to residents.
- During nighttime work, use smart back-up alarms, which automatically adjust the alarm level based on the background noise level, or switch off back-up alarms and replace with spotters.
- Use low-noise emission equipment.
- Implement noise-deadening measures for truck loading and operations.
- Monitor and maintain equipment to meet noise limits.

- Line or cover storage bins, conveyors, and chutes with sound-deadening material.
- Use acoustic enclosures, shields, or shrouds for equipment and facilities.
- Use high-grade engine exhaust silencers and engine-casing sound insulation.
- Prohibit aboveground jackhammering and impact pile driving during nighttime hours.
- Minimize the use of generators to power equipment.
- Limit use of public address systems.
- Grade surface irregularities on construction sites.
- Use moveable sound barriers at the source of the construction activity.
- Limit or avoid certain noisy activities during nighttime hours.

To mitigate noise related to pile driving, the use of an auger to install the piles instead of a pile driver would reduce noise levels substantially. If pile driving is necessary, limit the time of day that the activity can occur.

N&V-MM#2: **Construction vibration mitigation measures**. Building damage from construction vibration is only anticipated from impact pile driving at very close distances to buildings. If pile driving occurs more than 25 to 50 feet from buildings, or if alternative methods such as push piling or auger piling can be used, damage from construction vibration is not expected to occur. Other sources of construction vibration do not generate high enough vibration levels for damage to occur. Typically, once a construction scenario has been established, preconstruction surveys are conducted at locations within 50 feet of pile driving to document the existing condition of buildings in case damage is reported during or after construction. Damaged buildings would be repaired or compensation paid.

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Section 15.0

Design and Construction Permits

15.0 Construction Permits

15.1 National or Regionally Significant Projects

On March 22, 2012 the President signed an Executive Order 13604 "Improving Performance of Federal Permitting and Review of Infrastructure Projects". This executive order created an inter-agency initiative, spearheaded by the Office of Management and Budget, to institutionalize best practices to reduce the amount of time required to make permitting and review decisions and to improve environmental and community outcomes.

On September 21, 2012, as part of his We Can't Wait initiative, President Barack Obama announced the following two nationally and regionally significant surface transportation projects in California:

- California High Speed Rail – Central Valley Construction.
- San Francisco Downtown Ferry Terminal.

As a result of the President's executive order, federal agencies have identified a set of best practices for efficient review and permitting that range from expanding information technology (IT) tools to strategies for improving collaboration, such as having multiple agencies review a project concurrently, rather than sequentially. These best practices were institutionalized in the Presidential Memorandum on May 17, 2013, directing all relevant agencies to put these practices into effect. Refer to the Federal Infrastructure Projects Permitting Dashboard for more information and the tools available (Federal Infrastructure Projects Permitting Dashboard 2014).

The following sections provide discussion on design and construction permits. Refer to the FB RS 15% Design Baseline Report (URS/HMM/Arup Apr 2014) for additional discussion on environmental permits.

15.2 Design and Construction Permits

15.2.1 Geotechnical Permits

Geotechnical exploration permitting generally falls in two geographical categories: (1) permits for geotechnical exploration within waters of the U.S. and/or waters of the state (jurisdictional waters), and (2) those outside of jurisdictional waters. Permits for drilling in areas outside of jurisdictional waters are usually obtained from the local jurisdiction's (city, county) environmental health department to drill a boring. Permits to encroach on public road rights-of-way should be obtained from the municipality, county, or Caltrans, as appropriate, but usually can be included under general contractors' construction plans for encroachment.

Permits for drilling in areas within jurisdictional waters are usually obtained from the U.S. Army Corps of Engineers, utilizing a Nationwide Permit 6 (with no reporting requirements) and a Section 401 Certification to the Regional Water Quality Control Board or State Water Resources Control Board for review and certification.

For any drilling campaign, permits could be required by some or all of the agencies listed below:

- U.S Army of Corps of Engineers.
- California Department of Fish and Wildlife.
- U.S. Fish and Wildlife Service.
- Regional Water Quality Control Board.
- State Water Resources Control Board (SWRCB).

- County well permits (mandatory when subsurface drilling likely to intersect a saturated zone is required).
- Local jurisdiction encroachment permits.

These permits have reporting requirements, including preparation of permit applications by qualified natural and cultural resource specialists identifying potential impacts and/or developing appropriate avoidance and minimization measures. Following the submittal of permit applications, an application may take between 30 and 180 days to obtain depending on the agency and the permit.

Overall, geotechnical exploration activities to be performed by the contractor are expected to be conducted in areas for which project environmental clearances have been documented in the FEIR/EIS and associated decision documents (CEQA Notice of Determination [NOD] and NEPA Record of Decision [ROD]) for the FB Section.

15.2.2 Working in or Near Waterways

15.2.2.1 Best Management Practices

Best management practices (BMPs) can be utilized during different phases of the project. During construction, BMPs can be used to mitigate construction activities contributing to stormwater pollution. BMPs can also remove pollutants resulting from the O&M of a new project. BMPs for all categories are described briefly in Appendices A1, A2, and A3, with additional details available in the *California Stormwater Best Management Practice Handbook for Construction* (California Stormwater Quality Association [CASQA],] 2003a).

15.2.2.2 Construction Considerations

The construction site will be subject to the statewide National Pollutant Discharge Elimination general permit for construction activities, SWRCB Order No. 2009-0009-DWQ, and successor permits. Construction site BMPs will be selected and monitored in accordance with the Stormwater Pollution Prevention Plan (SWPPP) filed for the project by the contractor. The construction site BMPs will be selected based on established criteria and design guidelines outlined in either the Caltrans Stormwater Quality Handbook or the CASQA California Stormwater Quality Best Management Practice Handbook.

Construction activity may generate dewatering needs. To the extent practical, permanent retention facilities and other applicable drainage and stormwater facilities may be constructed in the early stages so as to serve as the discharge point for dewatering activities. The goal is to fully retain the dewatering activities within these retention facilities. However, to the extent dewatering activity discharges exceed the capacity of the retention facilities or are required to be directly discharged into surface water, the contractor will be subject to the monitoring and effluent discharge requirements set forth by the RWQCB, Central Valley Region Order No. R5-2008-0081. If so subject, the contractor will be required to prepare and submit a Pollution Prevention and Monitoring and Reporting Plan (PPMRP) and a Notice of Intent to RWQCB for approval.

15.2.2.3 Monitoring

During construction, a SWPPP and monitoring program will be performed with collected data submitted to RWQCB in compliance with the General Construction Permit. The overall objectives of the monitoring program are to monitor stormwater constituents of concern per the General Construction Permit as determined by project risk assessment level.

If dewatering is required and discharges into surface waters are found to be unavoidable, the contractor will be subject to the monitoring and effluent discharge requirements set forth by the RWQCB, Central Valley Region, and Order No. R5-2008-0081. If so subject, the contractor will be required to prepare and submit a PPMRP and a Notice of Intent to RWQCB for approval. If it is found necessary for HMFs to discharge to surface waters, these facilities will be subject to permitting under the SWRCB General Permit No. CAS000001 (industrial activities), as a transportation facility that conducts vehicle maintenance. Coverage under this permit would require preparation of a site-specific SWPPP and annual monitoring/reporting.

15.2.2.4 Pollutant Removal

Pollutant removal will be accomplished using treatment BMPs designed to remove pollutants from stormwater runoff prior to discharging (directly or indirectly) to receiving waters. Caltrans requires that permanent treatment BMPs be considered for all new construction and major reconstruction projects. Selection of treatment BMPs for the HSR will be based on the *Project Planning and Design Guide* (Caltrans, 2010).

Typically, a project must consider treatment for a targeted design constituent (TDC) when an affected water body within the project limits is on the Clean Water Act Section 303(d) list of impaired water bodies for one or more of the Section 303(d)-)–listed water quality parameters. A parameter meeting this condition is known as a primary pollutant of concern. TDCs identified in the *Project Planning and Design Guide* include phosphorus, nitrogen, total and dissolved copper, total and dissolved zinc, total and dissolved lead, and sediments. TDCs also include a category known as general metals, which include cadmium, nickel, chromium, and other trace constituents (such as selenium and arsenic).

Table 15.2-1 provides a preliminary list of permits, approvals, consultations, and agreements that may need to be in place prior to construction.

Table 15.2-1
Preliminary List of Design and Construction Permits, Consultations, and Requirements[1]

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
Federal Agencies			
1	Federal Railroad Administration	NEPA Department of Transportation Act Sections 4(f) and 6(f) 49 CFR Part 200-299	• Lead federal agency responsible for implementation of NEPA, and coordination with other federal agencies. • Responsible for coordination with federally recognized tribes under NHPA Section 106. • Responsible for use determinations for project impacts on properties protected under Section 4(f) or 6(f). Project designed to avoid use wherever feasible.

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CALIFORNIA High-Speed Rail Authority

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
2	Advisory Council on Historic Preservation	NHPA Section 106	Oversees compliance with NHPA; elected to participate as a signatory to the FB Section Memorandum of Agreement, per Section 106.
3	Department of Homeland Security		
4	Federal Aviation Administration	14 CFR 77.24 (aka Part 77)	Air space clearance for air craft facilities (e.g., landing strips, heliports)
5	Federal Communications Commission	47 CFR 17.7	Manages antenna structure registration, including for stand-alone radio sites for HSR - requires TOWAIR analysis.
6	Federal Emergency Management Agency		
7	National Marine Fisheries Service	Federal Endangered Species Act	The FRA has determined that there is no jurisdiction for the National Marine Fisheries Service in the FB Section.
8	Natural Resources Conservation Service	NRCS-CPA-106	
9	U.S. Army Corps of Engineering	• Federal Clean Water Act, Section 404 (Nationwide Permit and Individual Permit) • Rivers and Harbors Act, Section 408	• Oversees and issues permits governing projects that dredge or fill waters of the U.S. • Makes major or minor Section 408 determinations for projects that affect flow in waterways.
10	U.S. Environmental Protection Agency, Region 9	Federal Clean Air Act, Section 176(c)(4)	Oversees completion of the United States Environmental Protection Agency General Conformity Determination process. Party to the Checkpoint C MOA among Authority, FRA, USACE, and EPA.

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CALIFORNIA High-Speed Rail Authority

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
11	U.S. Fish and Wildlife Service, Region 8	Federal Endangered Species Act	Implementation of avoidance and minimization measures to avoid take of the species. Otherwise requires preparation of a Biological Assessment and request incidental "take" authorization under Section 7 of the federal Endangered Species Act. Initiation of consultation to be requested by FRA. The U.S. Fish and Wildlife Service prepared and issued a Biological Opinion in April 2014.
State Agencies			
12	California High-Speed Rail Authority	CEQA	Lead state agency responsible for implementation of CEQA for the HSR System, and responsible for coordination with other state and federal agencies.
13	California Air Resources Board	• Indirect Source Review (ISR) • Voluntary Emissions Reduction Agreement (VERA)	• Responsible for completing project ISR. • Administers VERA program
14	California Department of Conservation	Williamson Act Properties Government Code §§51290 - 51295 and 51296.6	Requires notification of project effects on Williamson Act contracts.
15	California Department of Fish and Wildlife, Region 4	• California Endangered Species Act (CESA) • California Fish and Game Code Section 2081 – Incidental Take Permit • Title 14 Memorandum of Agreement • California Fish and Game Code Section 1602 – Streambed Alteration Agreement Programmatic Permit	• Administers CESA • Reviews applications and issues Incidental Take Permit and incidental "take" authorization. Reviews applications and issues Streambed Alteration Agreement programmatic permits

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
16	Department of Transportation, District 6	Highway Design Manual	Prepare project reports and fact sheets for intersection of HSR with state highway facilities; obtain encroachment permits for activity within Caltrans right of way.
17	California Public Utilities Commission	• General Orders • Application to Construct	• Establishes design and safety requirements for electric utilities • Approves construction of new/modification of existing high-voltage power lines
18	California State Water Resources Control Board / Central Valley Regional Water Quality Control Board	• Federal Clean Water Act: Section 401 - State Water Quality Certification • Section 402 – NPDES Permit (Construction General Permit and Municipal Separate Storm Sewer Permit • Porter Cologne Act, Central Valley Basin Plan	• In partnership with the Central Valley Regional Water Quality Control Board, SWRCB issues Water Quality Certification's • Administers National Pollutant Discharge Elimination (NPDES) permitting for discharge of stormwater from construction sites and/or impacts on the beneficial uses of state jurisdictional waters. • Issues orders and waste discharge requirements for effluent discharge surface or groundwater.
19	Central Valley Flood Protection Board	• Section 208 Water Quality Management • Encroachment Permits	• Administers Clean Water Act Section 208 compliance in conjunction with USACE • Issues encroachment permits for projects encroaching into state jurisdictional waters

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No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
20	CalEPA Department of Toxic Substances Control	California Health and Safety Code	Regulates hazardous and toxic substances and oversees cleanup, management, transport, treatment and disposal of contaminated and hazardous materials and D/B contractors will need to coordinate disruption of remediation systems at known contaminated sites and coordinate disposal of hazardous or toxic substances.
21	Native American Heritage Commission	California Public Resources Code (PRC) 5097.98	Must be notified in the event human remains are encountered during construction.
22	Office of the State Fire Marshal	NFPA 101	Oversees development and enforcement of fire prevention engineering.

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
23	State Historic Preservation Office	• National Historic Preservation Act (NHPA) • CEQA	• Ensures that the compliance obligations under Section 106 of the NHPA are followed, which requires the lead federal agency of an undertaking to consider the effects of their actions on the properties that are listed or may be eligible for listing in the National Register of Historic Places. Requires preparation of a Section 106 report that evaluates the significance of archaeological, historical, and architectural properties, and develops treatment plans in accordance with the Secretary of the Interior Standards for Treatment of Historic Properties and Cultural Landscapes. To be executed through a programmatic agreement and a memorandum of agreement with the project proponents and other consulting or concurring parties. Oversees Native American consultations. • Manages CEQA compliance for historical resources.

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
24	California Department of Parks and Recreation	Proposition 1A, 1974	• Administers 280 state park units, including Colonel Allensworth State Historic Park between the BNSF and Allensworth Bypass Alternatives. • Oversees administration of federal and state historic preservation programs.
Local Agencies			
25	Cities of Bakersfield, Corcoran, Fresno, Hanford, Shafter, and Wasco	City ordinances and General Plans	Implement city ordinances and manages development in accordance with the General Plan, including; • Encroachment permits • Demolition permits • Construction Management Plan • Transportation Management Plans • Maintenance Agreements • Noise restrictions • Water connection permit • Wastewater discharge permits • Must concur with FRA use determinations for city-owned Section 4(f) and 6(f) properties

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
26	Counties of Fresno, Kern, Kings, and Tulare	• County code and master plans • Williamson Act	The counties implement county ordinances and manage development in accordance with the county Master Plan, including; • Encroachment permits • Easement abandonment permits • Well permits for wells, piezometers, and exploratory borings that intersect the saturated zone. • Transportation Management Plans • Noise restrictions • Maintenance agreements • Wastewater discharge permits • Modify contracts for any affected Williamson Act properties.
27	San Joaquin Valley Air Pollution Control District	• Rule 9510 Indirect Source Review (ISR) Rule 201, General Permit Requirements Rule 403, Fugitive Dust Requirements Rule 442, Agriculture Coatings Requirements Rule 902, Asbestos Requirements • Federal Clean Air Act, Title V; San Joaquin Valley Unified Air Pollution Control District (SJVAPCD) Regulation II	• Must comply with Rule 9510 ISR mitigation requirements. • Permits for stationary-source emissions sources associated with the Fresno, Hanford, and Bakersfield stations and maintenance facilities located within SJVAPCD jurisdiction.

No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
Water Agencies			
28	• Alpaugh Irrigation District • Angiola Water District • Arvin-Edison Water Storage District • Atwell Island Water District • California Water Service Company • Consolidated Irrigation District • Corcoran Irrigation District • Fresno Irrigation District • Kaweah Delta Water Conservation District • Kern County Water Agency Improvement District #4 • Kings River Conservation District • Kings County Water District • Lakeside Irrigation Water District • Liberty Water District • Lower Tule River Irrigation District • North Kern Water Storage District • Pixley Irrigation District • Pond Poso Improvement District • Rosedale Ranch Improvement District • Rosedale-Rio Bravo Water Storage District • Semitropic Water Storage District • Shafter-Wasco Irrigation District • Vaughn Water Company	License Agreements	• Encroachment permits • Maintenance agreements • Operations agreements (e.g., minimum flow requirements) • Seasonal restrictions on construction
Other Agencies			
29	BNSF Railway Company	• Operational guidelines • Safety controls	• Encroachment permits • Operations coordination • Responsible for design and construction of relocations
30	San Joaquin Valley Rail Committee		

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No.	Jurisdictional Agency	Code, Reg, Std or Guideline	Notes
31	Underground Service Alert (USA)	• California Law California Business Professions Code Section 7110, page 22 California • Government Code (CGC) 4216 requirements, pages 23 - 31	Must call (800) 227-2600 2 working days or up to 14 calendar days prior to digging.
32	Union Pacific Railroad	• Operational guidelines • Safety controls	• Encroachment permits • Operations coordination • Responsible for design and construction of relocations
33	Utility owners (electric, gas, pipelines, etc.)	Various	Must coordinate relocations and service interruptions

[1] This table is based on information available at the PE4P level of design. Not all listed entities may be affected by construction or operation of the HSR, and other entities not listed may be affected. This list is not intended as a basis for construction planning. The Authority and/or design/build contractors will be responsible for identifying and complying with all applicable federal, state, and local requirements.

Section 16.0

References

16.0 References

California Department of Transportation (Caltrans). 2010. *Project Planning and Design Guide*.

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URS/HMM/Arup Joint Venture. 2014. *Draft PE4P CP2-3 Basis of Quantities Report*

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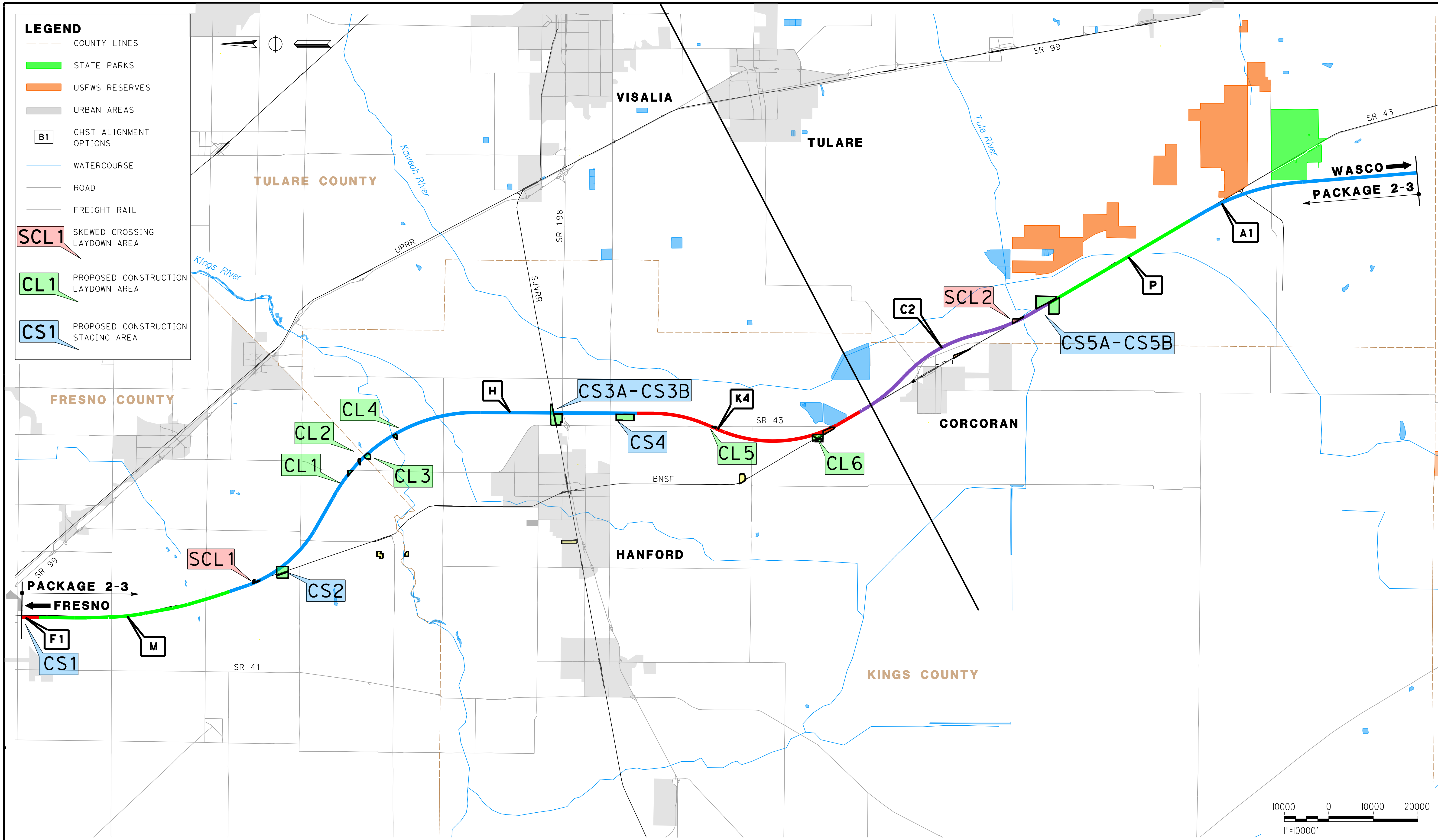
Appendix A

Construction Package 2-3 Alignment



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SEYMOUR
DRAWN BY P. TONKIN
CHECKED BY D. HUNT
IN CHARGE R. COFFIN
DATE 02/04/14

PROPOSED PRELIMINARY DESIGN

NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD
PACKAGE 2-3
ALIGNMENT
LOCATION MAP

CONTRACT NO. HSR 06-0003
DRAWING NO. TT-B0001
SCALE AS SHOWN
SHEET NO. 1 OF 4

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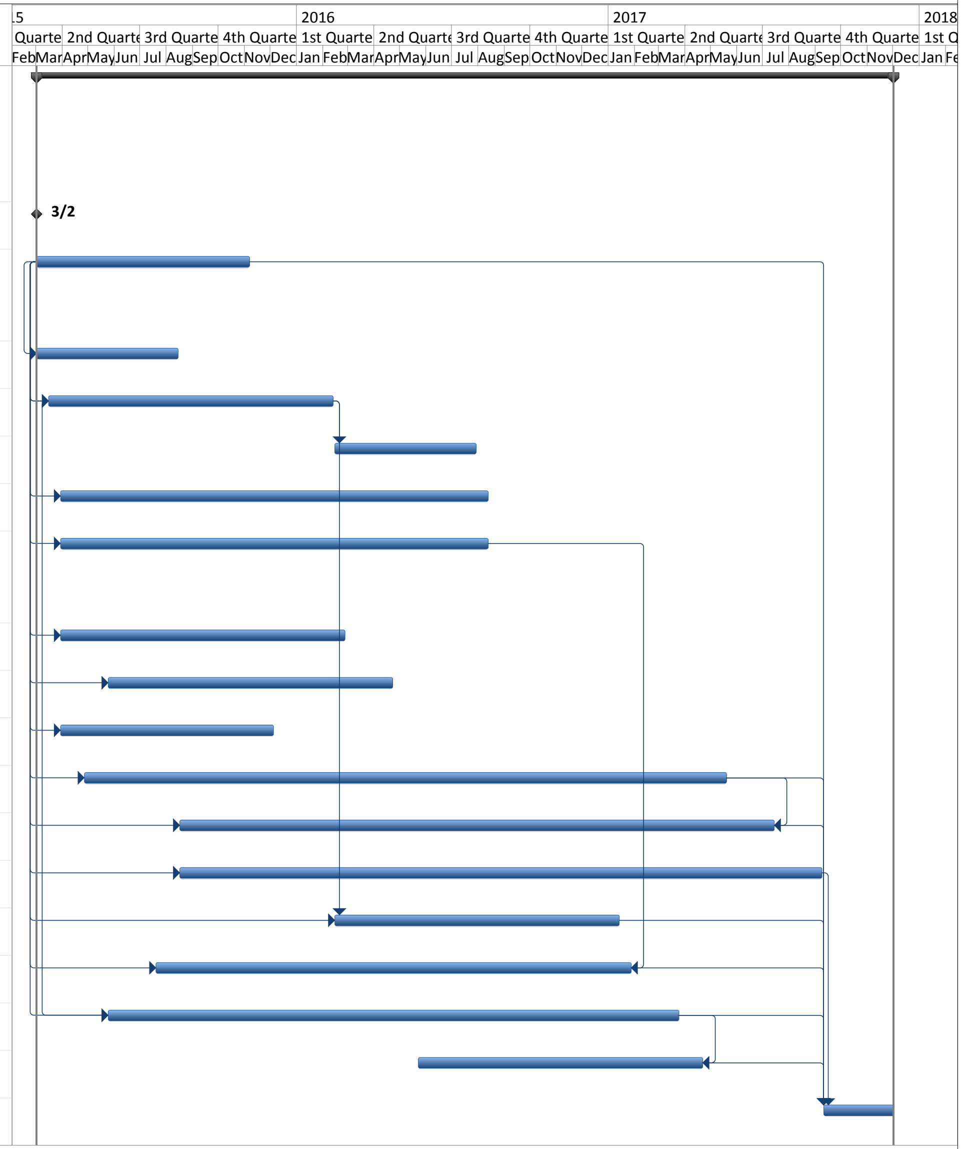
Appendix B

Preliminary Construction Schedule Analysis

ID		Task Mode	Task Name	Duration	Start	Finish
1			**CP 2-3 Expected Construction Sequence and Durations assuming 6 working locations for standard viaduct construction**	**720 days**	**Mon 3/2/15**	**Fri 12/1/17**
2			Right-of-Way Acquisitions - Completed by Authority	0 days	Mon 3/2/15	Mon 3/2/15
3			DB Contractor Mobilization - Set up Staging Area/s & Precasting Facilities	9 mons	Mon 3/2/15	Fri 11/6/15
4			DB Contractor Acquires Necessary additional TCE's	6 mons	Mon 3/2/15	Fri 8/14/15
5			Critical Area Utility Relocations	12 mons	Mon 3/16/15	Fri 2/12/16
6			Non Critical Area Utility Relocations	6 mons	Mon 2/15/16	Fri 7/29/16
7			Canal Relocations - 12.43 miles	18 mons	Mon 3/30/15	Fri 8/12/16
8			Railroad Relocations - 5.5 miles of 2 track mainline, 4.4 miles of spur track	18 mons	Mon 3/30/15	Fri 8/12/16
9			Hydrolic Crossings 166 ea	12 mons	Mon 3/30/15	Fri 2/26/16
10			Wildlife Crossings - 70 ea	12 mons	Mon 5/25/15	Fri 4/22/16
11			Demolition - Buildings and Roadway Structures	9 mons	Mon 3/30/15	Fri 12/4/15
12			Steel Structures - 0.52 miles (5 on H, 1 on C2)	27 mons	Mon 4/27/15	Fri 5/19/17
13			Complex Structures - 1.71 miles (H, K4 & C2)	25 mons	Mon 8/17/15	Fri 7/14/17
14			Standard Structures - 7.24 miles (H, K4, C2 & A1)	27 mons	Mon 8/17/15	Fri 9/8/17
15			Retained Fill - 5.08 miles	12 mons	Mon 2/15/16	Fri 1/13/17
16			At grade - 51.16 miles	20 mons	Mon 7/20/15	Fri 1/27/17
17			Roadway Overcrossings - 30 ea (15 per year)	24 mons	Mon 5/25/15	Fri 3/24/17
18			Roadway Modifications including Demo Existing Roadways	12 mons	Mon 5/23/16	Fri 4/21/17
19			Demobilization	3 mons	Mon 9/11/17	Fri 12/1/17

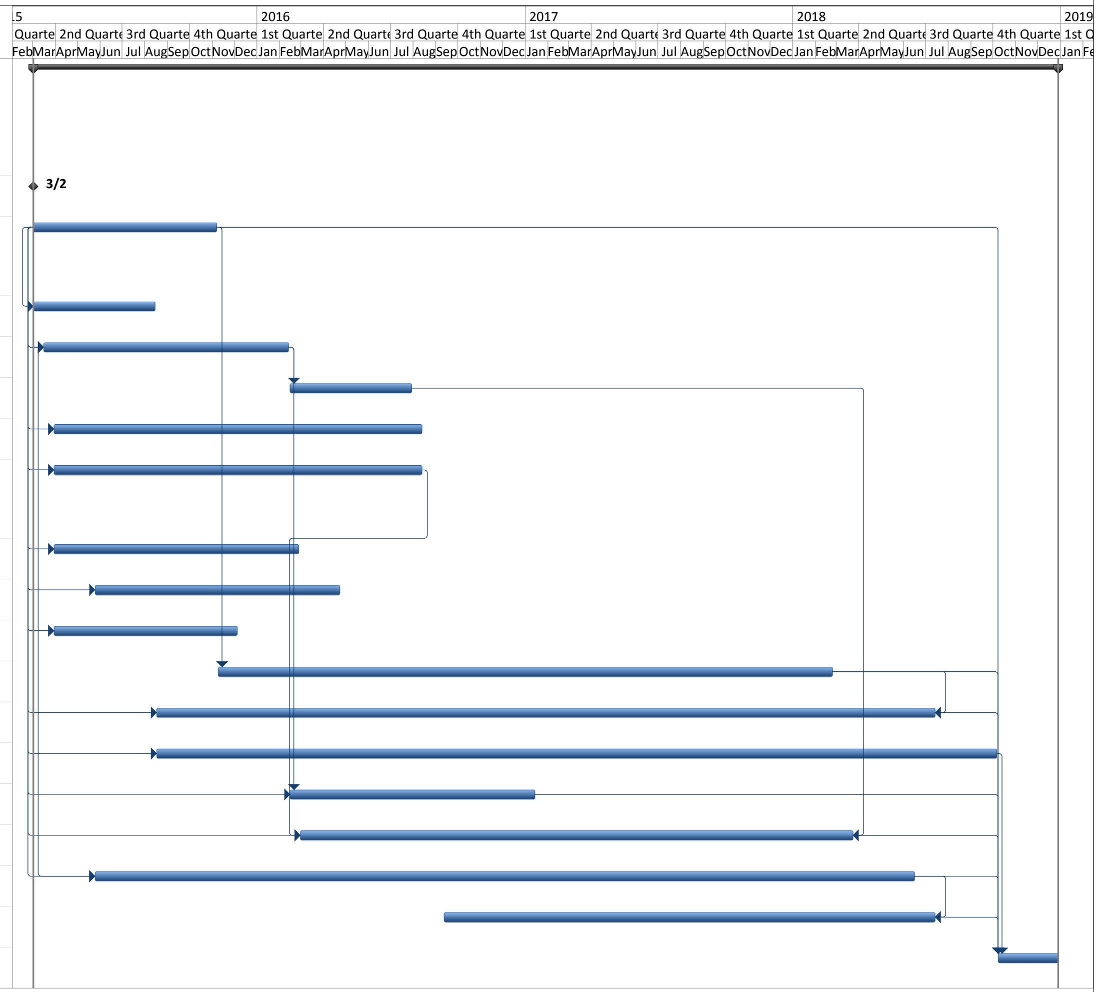


Project: CP 2-3 Construction sequ
Date: Fri 2/14/14

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
Split		External Tasks		Inactive Summary		Manual Summary		Progress	
Milestone		External Milestone		Manual Task		Start-only			
Summary		Inactive Task		Duration-only		Finish-only			

CHSTP CP 2-3 Construction Sequencing and Durations

ID	Task Mode	Task Name	Duration	Start	Finish
1		**CP 2-3 Expected Construction Sequence and Durations assuming 4 working locations for standard viaduct construction**	**1000 days**	**Mon 3/2/15**	**Fri 12/28/18**
2		Right-of-Way Acquisitions - Completed by Authority	0 days	Mon 3/2/15	Mon 3/2/15
3		DB Contractor Mobilization - Set up Staging Area/s & Precasting Facilities	9 mons	Mon 3/2/15	Fri 11/6/15
4		DB Contractor Acquires Necessary additional TCE's	6 mons	Mon 3/2/15	Fri 8/14/15
5		Critical Area Utility Relocations	12 mons	Mon 3/16/15	Fri 2/12/16
6		Non Critical Area Utility Relocations	6 mons	Mon 2/15/16	Fri 7/29/16
7		Canal Relocations - 12.43 miles	18 mons	Mon 3/30/15	Fri 8/12/16
8		Railroad Relocations - 5.5 miles of 2 track mainline, 4.4 miles of spur track	18 mons	Mon 3/30/15	Fri 8/12/16
9		Hydrolic Crossings 166 ea	12 mons	Mon 3/30/15	Fri 2/26/16
10		Wildlife Crossings - 70 ea	12 mons	Mon 5/25/15	Fri 4/22/16
11		Demolition - Buildings and Roadway Structures	9 mons	Mon 3/30/15	Fri 12/4/15
12		Steel Structures - 0.52 miles (5 on H, 1 on C2)	30 mons	Mon 11/9/15	Fri 2/23/18
13		Complex Structures - 1.71 miles (H, K4 & C2)	38 mons	Mon 8/17/15	Fri 7/13/18
14		Standard Structures - 7.24 miles (H, K4, C2 & A1)	41 mons	Mon 8/17/15	Fri 10/5/18
15		Retained Fill - 5.08 miles	12 mons	Mon 2/15/16	Fri 1/13/17
16		At grade - 51.16 miles	27 mons	Mon 2/29/16	Fri 3/23/18
17		Roadway Overcrossings - 30 (9 per year)	40 mons	Mon 5/25/15	Fri 6/15/18
18		Roadway Modifications including Demo Existing Roadways	24 mons	Mon 9/12/16	Fri 7/13/18
19		Demobilization	3 mons	Mon 10/8/18	Fri 12/28/18

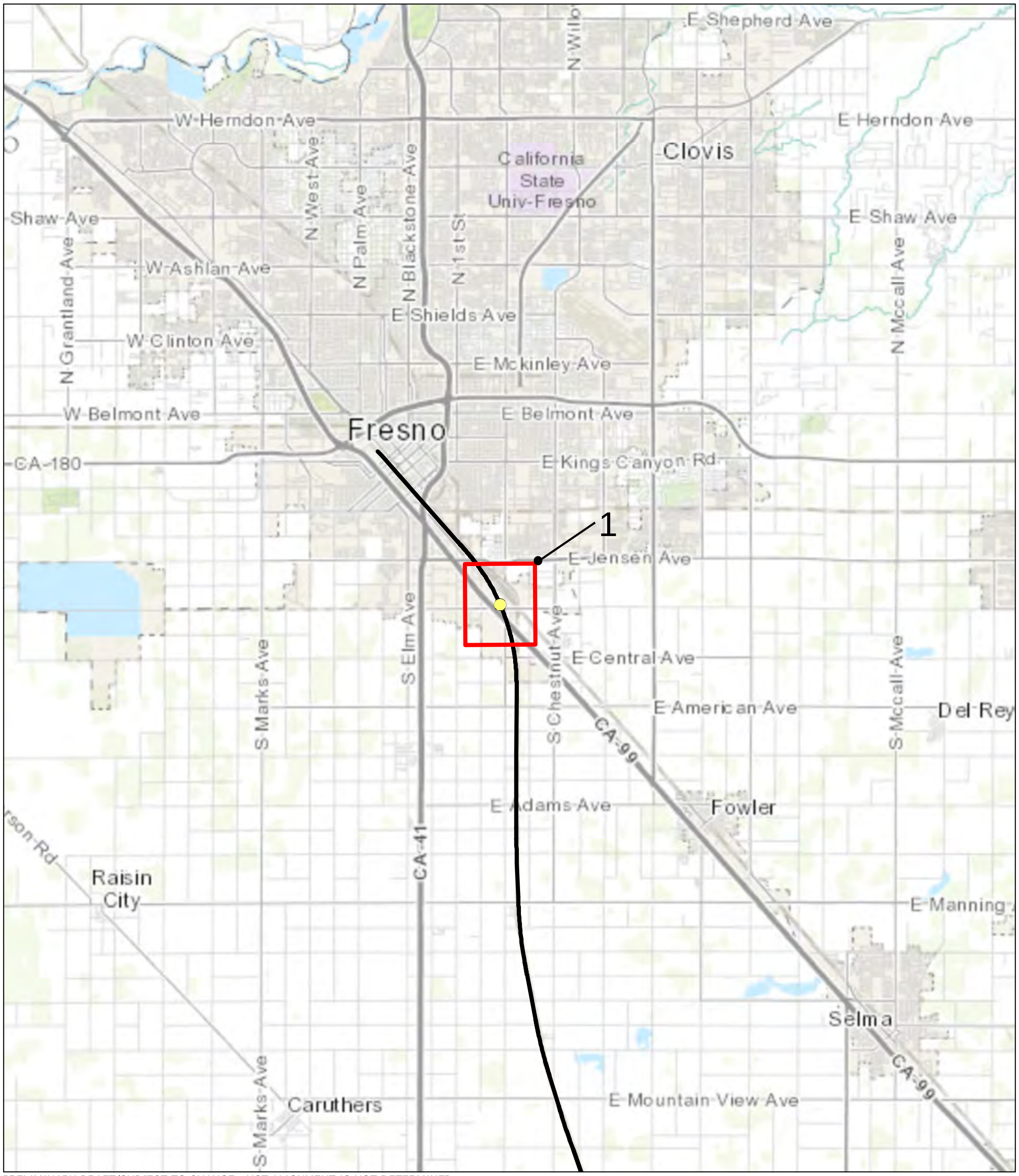


Project: CP 2-3 Construction sequ
Date: Fri 2/14/14

Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Finish-only
Split	Project Summary	Inactive Task	Manual Task	Manual Summary	Deadline
Milestone	External Tasks	Inactive Milestone	Duration-only	Start-only	Progress

Appendix C

Fresno to Bakersfield Oil Wells Map Book Extract



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

October 1, 2013

Source: Draft 15% Design (URS/HMM/Arup, 2013); DOGGR, 8/2013.

N

0 1 2
Miles

0 2 4
Kilometers

Alignment

Sheet

Well location

Mapbook Index
Fresno Vicinity: DOGGR Well Locations

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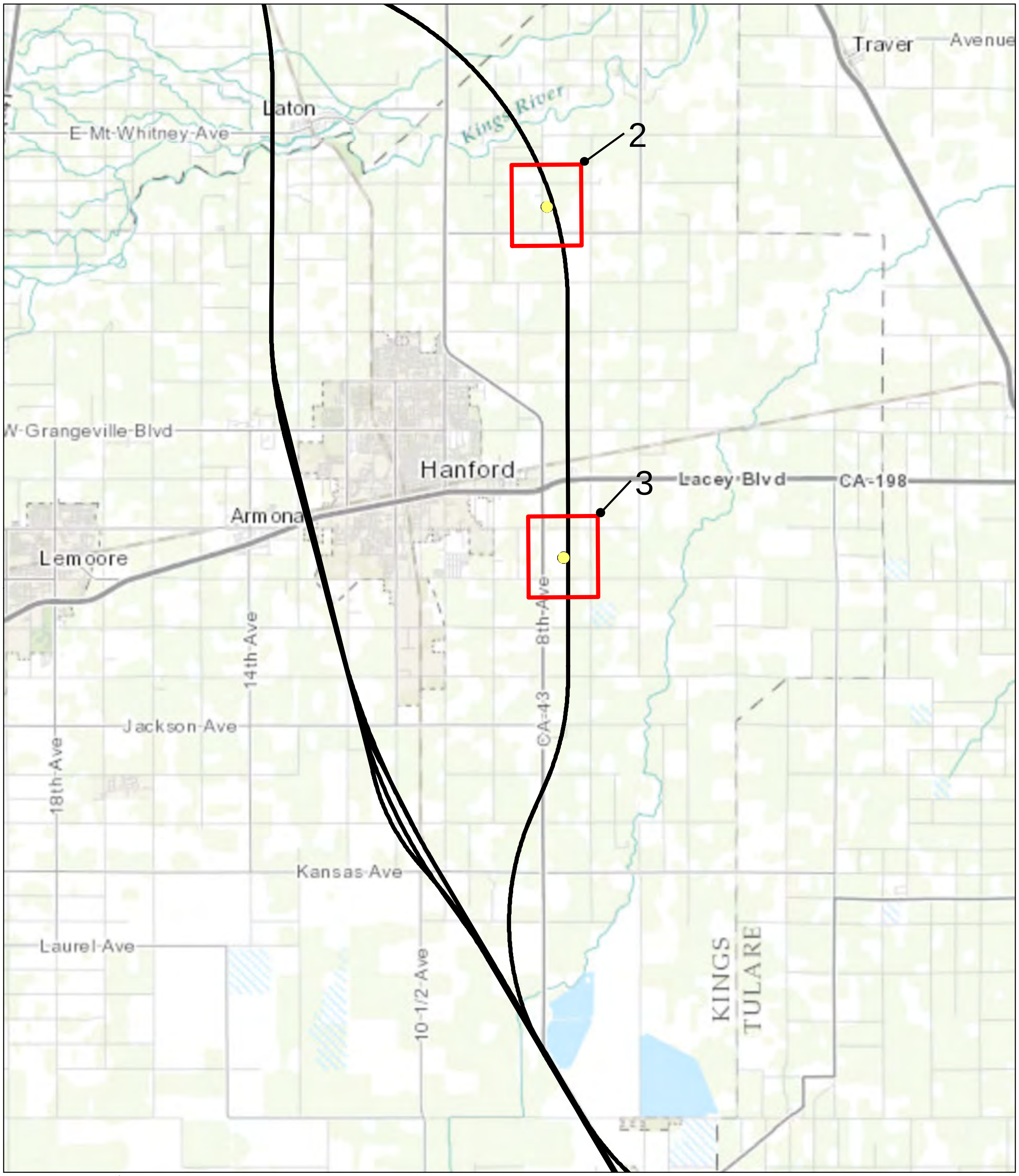
CALIFORNIA High-Speed Rail Authority

U.S. Department of Transportation
Federal Railroad Administration



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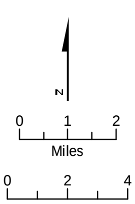
October 1, 2013



Alignment
Sheet
Well location

Mapbook Index
Hanford Vicinity: DOGGR Well Locations

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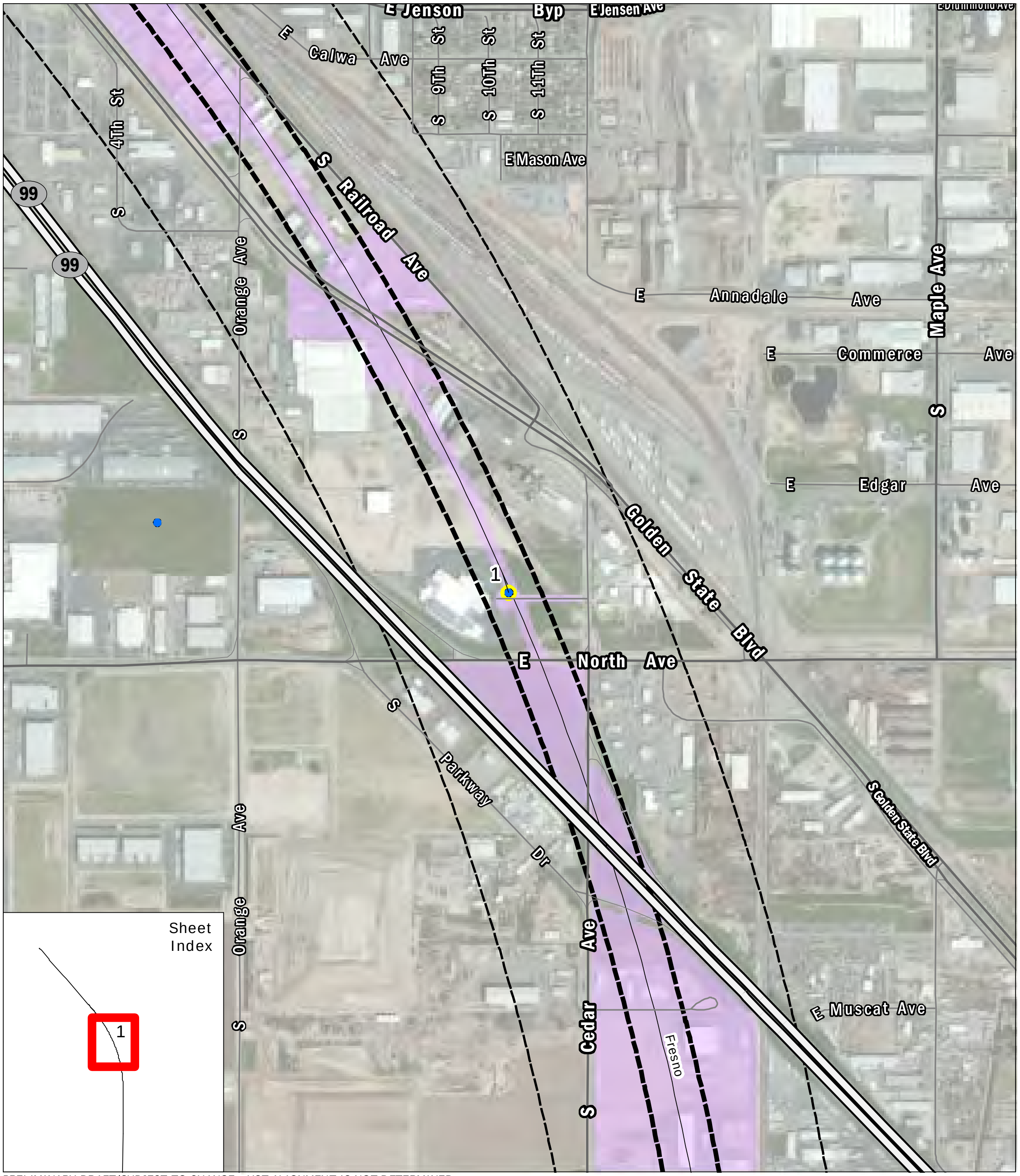


PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

October 1, 2013

Source: Draft 15% Design (URS/HMM/Arup, 2013); DOGGR, 8/2013.
*Buffer zones are measured from the closest HST track centerline (approximately 210' and 1010' from HST track alignment centerline), based on the April 2013 draft 15% design.

N

0 500 1,000
Feet

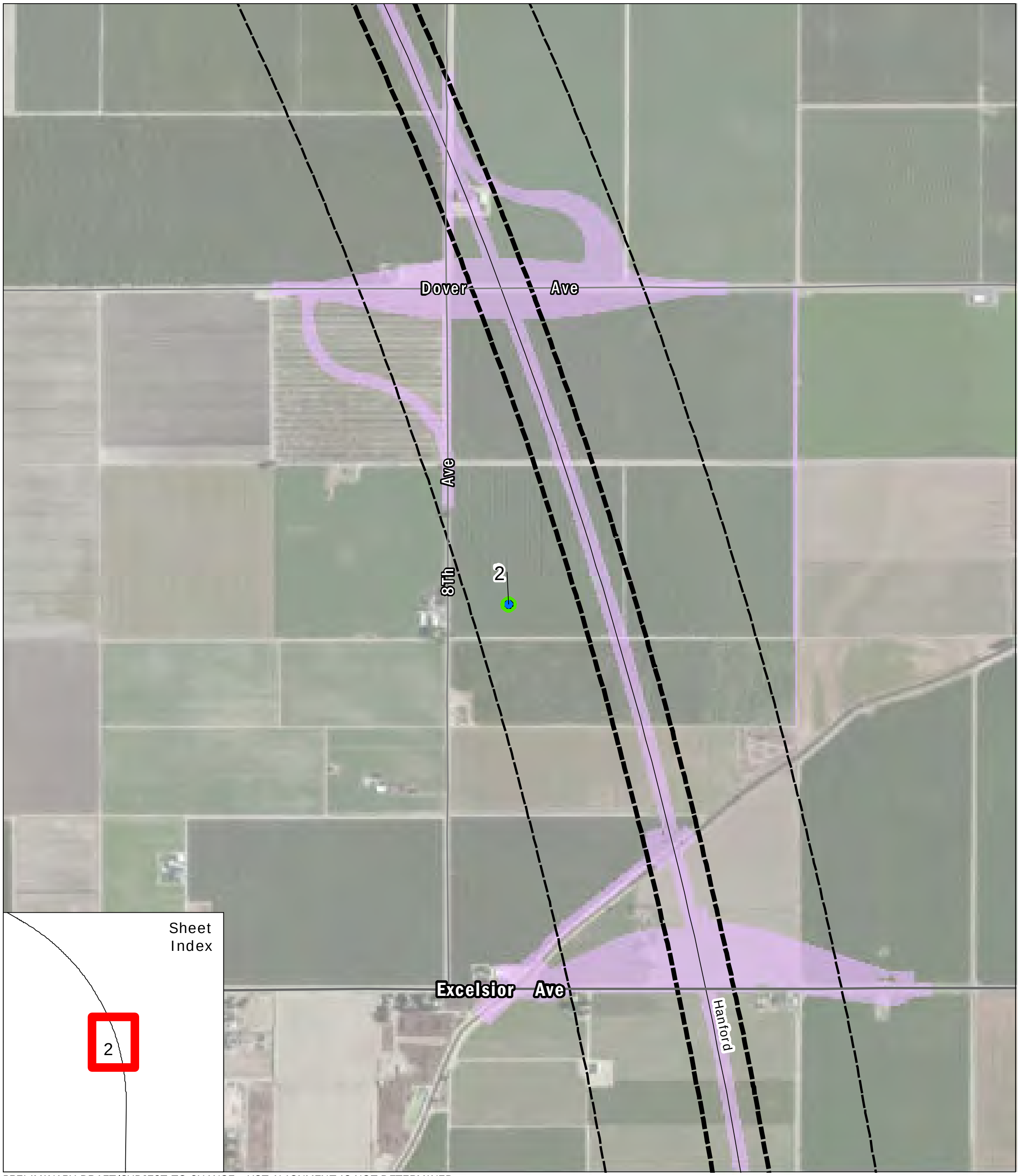
0 250 500
Meters

Alignment
Footprint (4-24-2013)
Active Well
New Well
Plugged Well
200-foot clearance zone*
1000-foot assessment zone*
Within 200-foot clearance zone
Within 1000-foot assessment zone and/or footprint
Well occurs in multiple alternatives

Mapbook
Sheet 1 of 33
Fresno: DOGGR Well Locations

CALIFORNIA High-Speed Rail Authority

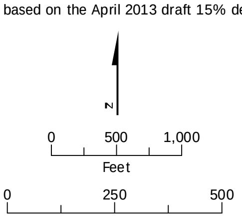
U.S. Department of Transportation
Federal Railroad Administration



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

October 1, 2013

Source: Draft 15% Design (URS/HMM/Arup, 2013); DOGGR, 8/2013.
*Buffer zones are measured from the closest HST track centerline (approximately 210' and 1010' from HST track alignment centerline), based on the April 2013 draft 15% design.



- Alignment
- Footprint (4-24-2013)
- Active Well
- New Well
- Plugged Well
- 200-foot clearance zone*
- 1000-foot assessment zone*
- Within 200-foot clearance zone
- Within 1000-foot assessment zone and/or footprint
- Well occurs in multiple alternatives

Mapbook
Sheet 2 of 33
Hanford: DOGGR Well Locations

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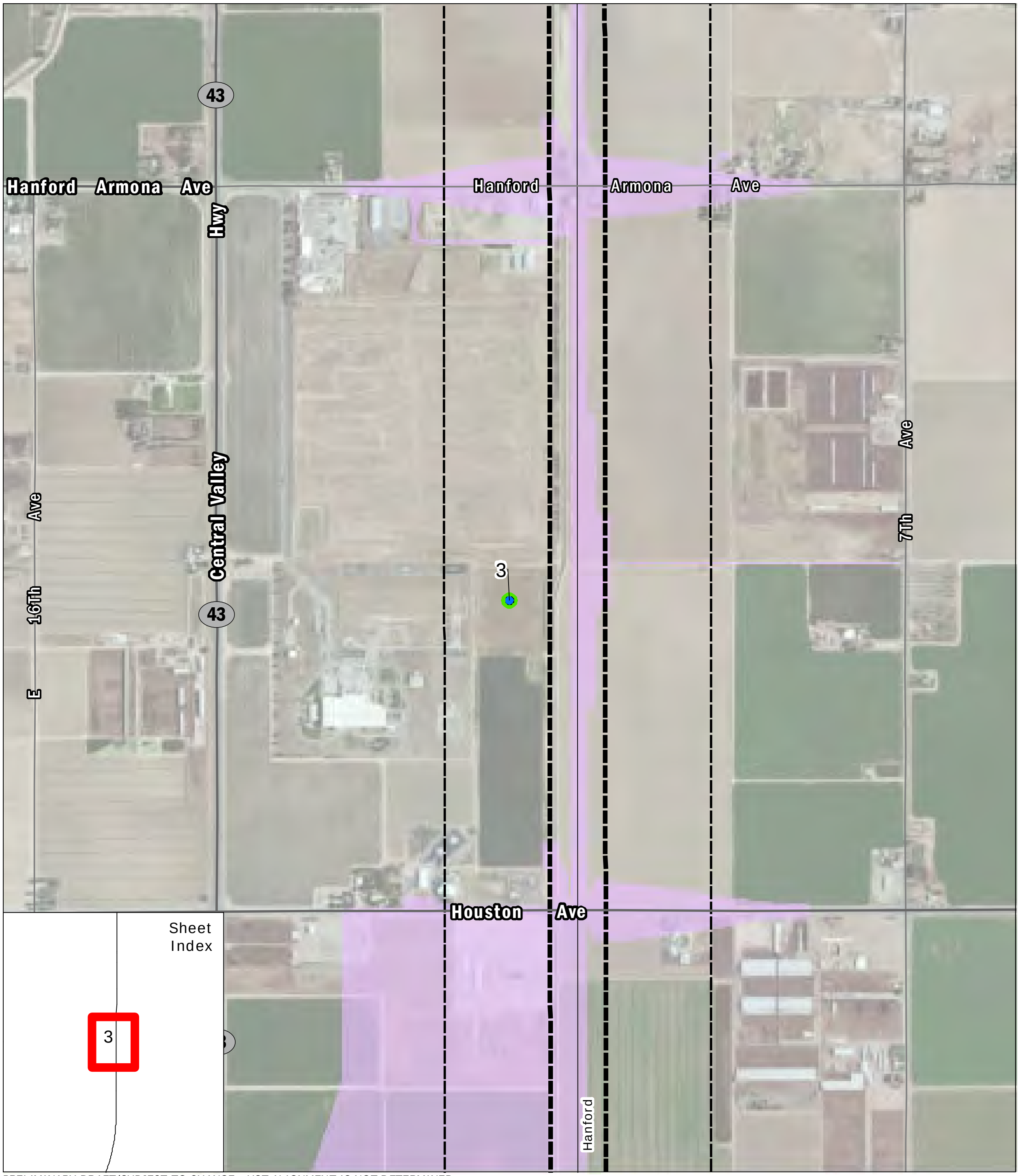
CALIFORNIA High-Speed Rail Authority

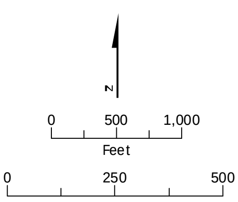
U.S. Department of Transportation Federal Railroad Administration



PRELIMINARY DRAFT/SUBJECT TO CHANGE - HST ALIGNMENT IS NOT DETERMINED

October 1, 2013

Source: Draft 15% Design (URS/HMM/Arup, 2013); DOGGR, 8/2013.
*Buffer zones are measured from the closest HST track centerline (approximately 210' and 1010' from HST track alignment centerline), based on the April 2013 draft 15% design.



Alignment
Footprint (4-24-2013)
Active Well
New Well
Plugged Well
200-foot clearance zone*
1000-foot assessment zone*
Within 200-foot clearance zone
Within 1000-foot assessment zone and/or footprint
Well occurs in multiple alternatives

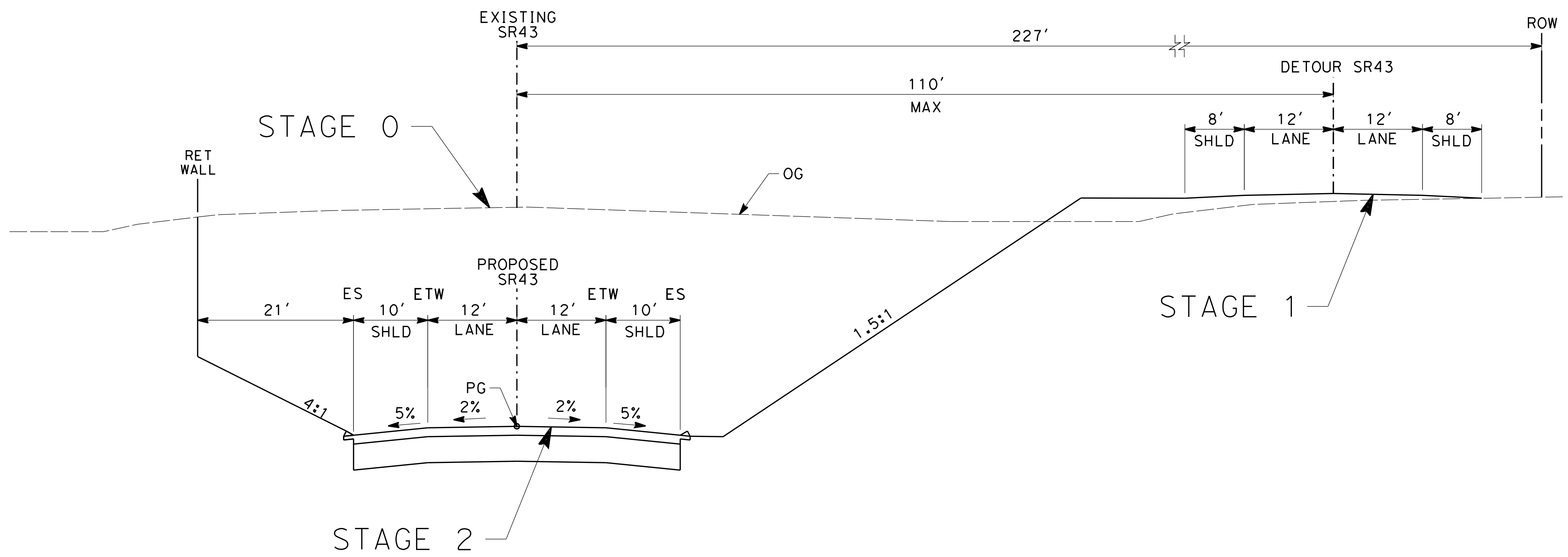
Mapbook
Sheet 3 of 33
Hanford: DOGGR Well Locations

RFP No.: 13-57 – Addendum No. 2 - 06/30/2014

Appendix D

SR43 Temporary Traffic Detour

RFP No.: 13-57 – Addendum No. 2 - 06/30/2014



SR43 STAGING

STAGE	TRAFFIC	CONSTRUCT
0	EXISTING SR 43	NEW DETOUR
1	DETOUR	NEW SR 43 (PERMANENT) AND PORTION OF BRIDGE FOUNDATION
2	NEW SR 43	BRIDGE, REMAINDER OF EXCAVATION AND REMOVE DETOUR

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY T. CLIFFORD
DRAWN BY I. JOSIFEK
CHECKED BY B. RAWSON
IN CHARGE R. COFFIN
DATE 05/06/14

PROPOSED PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

URS | HMM | ARUP
CALIFORNIA HIGH-SPEED TRAIN

CALIFORNIA HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT
FRESNO TO BAKERSFIELD
APPENDIX D
ALIGNMENT K4
CONSTRUCTION STAGING
SR 43 / JERSY AVE OVERCROSSING

CONTRACT NO.
DRAWING NO. D.1
SCALE NTS
SHEET NO. 1 OF 1

Appendix E

Third Party Coordination

Third Party Coordination List

	Entity	Utility "A" Letters	HH&D Meeting	Other Communications
1	Alon USA Energy			
2	Alpaugh Irrigation Dist.	Sent	Yes	
3	Alta Irrigation District	Sent		
4	Angiola Water Dist.	Sent	Yes	
5	Arvin-Edison Water Storage Dist.		Yes	
6	AT&T	Sent		
7	Atwell Island ID	Sent		
8	BNSF Railway Company			
9	Brighthouse Networks, Inc.			
10	CA Dept. of Transportation			Project Report
11	California Rangeland Trust			
12	California Water Service Company (Calwater)			
13	Bakersfield District		Yes	
14	Kern River Valley District			
15	Selma District	Sent		
16	Visalia District	Sent		
17	Cawelo WD	Sent	Yes	
18	Central Valley Flood Protection Board		Yes	
19	Century Link LLC			
20	Charter Communication Cable	Sent		
21	CHEVRON	Sent		
22	City of Bakersfield			
23	City of Corcoran	Sent	Yes	
24	City of Felano	Sent		
25	City of Fresno	Sent		
26	City of Hanford	Sent		
27	City of McFarland	Sent		
28	City of Selma	Sent		
29	City of Shafter	Sent	Yes	
30	City of Tulare	Sent		
31	City of Visalia	Sent		
32	City of Wasco	Sent	Yes	
33	Comcast Cable	Sent		
34	Comcast of Sacramento, LLC			
35	Consolidated Irrigation Dist.	Sent	Yes	
36	Corcoran Irrigation Company		Yes	
37	Corcoran Irrigation Dist.	Sent	Yes	
38	County of Fresno	Sent	Yes	
39	County of Kern	Sent	Yes	
40	County of Kings	Sent	Yes	
41	County of Madera			
42	County of Tulare	Sent		
43	Cross Creek Flood Control Dist.		Yes	
44	Cross Valley Railroad			
45	Delano-Earlimart Irrigation District	Sent		
46	Equilon Enterprises, LLP dba Shell Oil Products USA and San Pablo Pay Pipeline Company LLC			
47	Fresno Irrigation Dist.	Sent	Yes	
48	Fresno Metropolitan Flood Control Dist.	Sent		
49	Friant Kern Water Authority		Yes	
50	JG Boswell Company	Sent	Yes	
51	JG Boswell Water District		Yes	
52	Kaweah-Delta Water Conservation District	Sent		Contacted
53	Kern County Water Agency		Yes	
54	Kern Delta Water District		Yes	
55	Kern Tulare Water Dist.			
56	Kinder Morgan, SFPP, LP	Sent		

57	Kings County Water Dist.	Sent		Contacted
58	Kings River Conservation Dist.	Sent	Yes	
59	Kings River Water Association		Yes	
60	Laguna Irrigation Dist.	Sent	Yes	
61	Lakeside Ditch Company		Yes	
62	Lakeside Irrigation Water Dist.	Sent	Yes	
63	Last Chance Water Ditch Company		Yes	
64	Level 3 Communications, LP			
65	Liberty Canal Company		Yes	
66	Liberty Water District	Sent	Yes	
67	Los Angeles County Metropolitan Transportation Authority			
68	Lovelace Water Corporation		Yes	
69	Lower Tule River Irrigation Dist.	Sent	Yes	
70	Madera Irrigation Dist.			
71	Malaga County Water District			
72	Melga Canal Company		Yes	
73	Melga Water District			
74	Murphy Slough Association		Yes	
75	New Deal Ditch Company			
76	North Kern Water Storage Dist.	Sent	Yes	
77	North of River Sanitary Dist.	Sent	Yes	
78	Pacific Bell and Telephone Company dba AT&T California			
79	Pacific Gas and Electric Company	Sent		
80	Pixley Irrigation District	Sent		
81	Rosedale Rio Bravo Water Storage District		Yes	
82	San Joaquin Valley Railroad			
83	San Luis & Delta-Mendota Water Authority	Sent		
84	Science Applications International Corporation (SAIC)	Sent		
85	Selma Kingsburg Fowler (SKF)	Sent		
86	Semitropic Water Storage Dist.	Sent	Yes	
87	Settlers Ditch Company			
88	Shafter-Wasco Irrigation Dist.	Sent	Yes	
89	SJVAPCD Voluntary Emission Reduction Agreement			
90	South San Joaquin ID			
91	Southern California Edison	Sent		
92	Southern California Gas Company	Sent		
93	Southern California Regional Rail Authority			
94	Southern San Joaquin Municipal Utility District	Sent	Yes	
95	Sprint			
96	The Peoples Ditch Company		Yes	
97	Tulare Irrigation District	Sent		
98	tw telecom of california, l.p.			
99	Union Pacific Railroad Company			
100	Unknown - Irrigation Facilities			
101	Unknown - Telecom / Power			
102	USACE			Section 408 Determination
103	US Bureau of Reclamation			
104	Vaughn Water Company		Yes	
105	Verizon California, Inc./MCI/Verizon Partners	Sent		
106	Vollmar Consulting			